

AUTOMOTIVE INDUSTRIES

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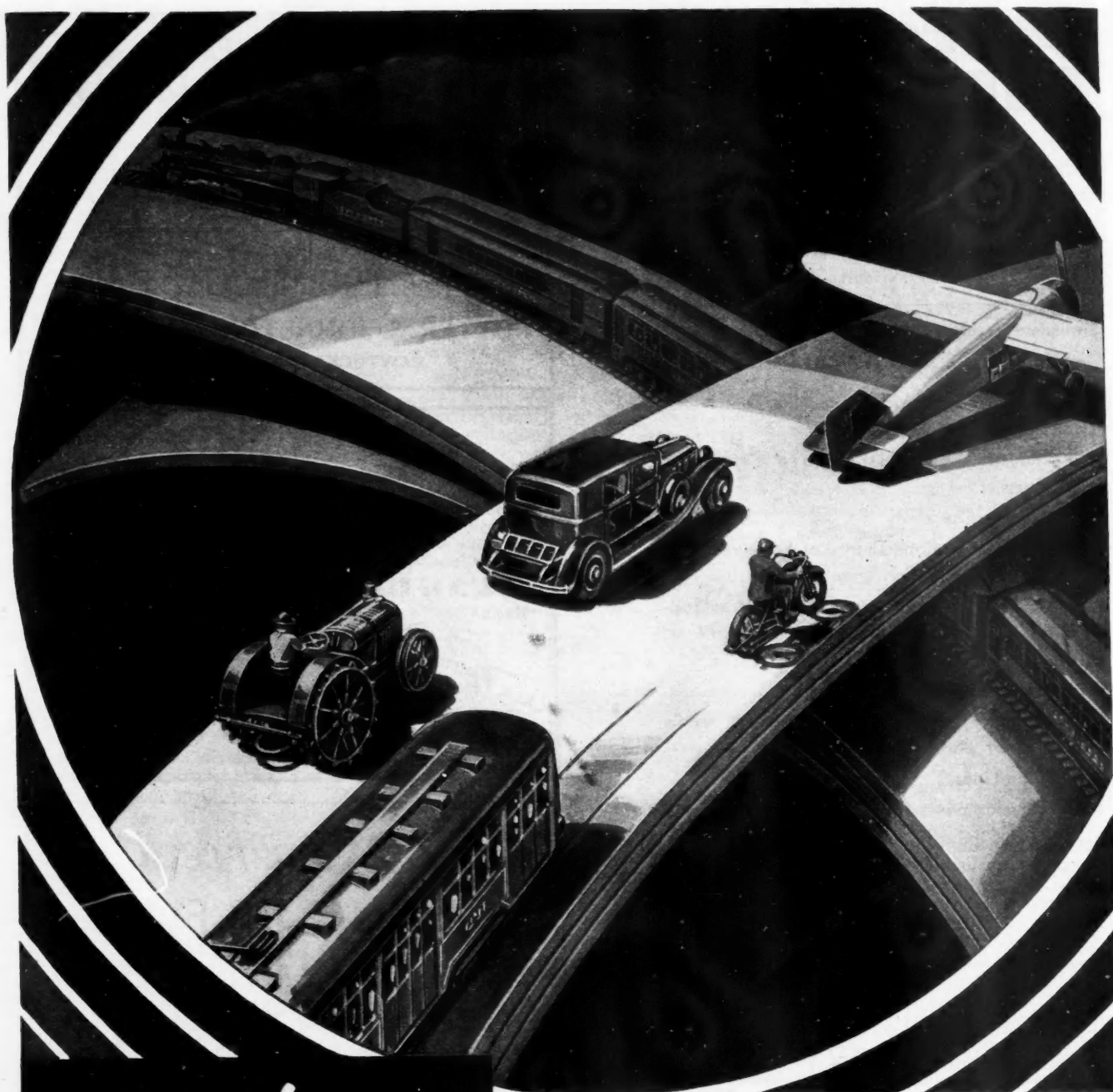
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May 20, 1933



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May 20, 1933

Automotive Industries

Some Factors
That Affect—

Machine Tool Prices

And some things which can be
done to place price calculation
on a sounder basis

ON what basis shall we judge whether the price of a piece of production equipment is high or low? Of course, one fairly reliable yardstick is productivity, since it provides a direct measure of the utility of existing equipment, and gives a comparison with new equipment, and between or among competing equipment whether old or new. On this basis, one manufacturer estimates that the price of machine tools has dropped from 10 per cent to 40 per cent below the price levels established in 1928.

Needless to say, any discussion of production equipment prices

should comprehend a distinction between standard types of machines on the one hand and flexible, automatic equipment on the other.

What is the justification for the present level of prices of high production manufacturing equipment? Need we look any further than the demands of current production? Foremost of these are the demands for better quality,

by Joseph Geschelin

Engineering Editor,
Automotive Industries

better surface finish, closer tolerances, finer clearances—all at lower cost. To meet all these requirements, the new machines must be designed so as to utilize the latest types of cutting tools and must be capable of higher speeds and feeds, all of which calls for special anti-friction bearings, increased motive power and greater weight and size of parts to obtain rigidity. There has, therefore, been an unprecedented increase in the size, weight and cost of high production equipment to handle approximately the same range of work.

Several days ago we saw an extreme example of this in the development of a 60-in. roll grinder. The requirements of surface quality were so severe that it was impractical to use gearing in the driving head. Consequently it was necessary to effect the desired speed reduction between the electric motor and the driving head through an expensive layout of belts and pulleys. Moreover, the head stock was almost double the length, and the spindle almost double the diameter of an older type of grinder of the same rating. Obviously, it would be futile to expect the price of this machine



to be the same as that of the older one.

And here's something else along the same line. It is axiomatic that any tool or gage must be constructed with finer limits than those of the work which it produces. Think what the limits have to be in the mating parts of a machine tool required to produce work within a tolerance of say 0.0005 in. Not the least of the difficulties introduced by this turn of events is the fact that the construction of the machine tool is slowed down considerably because of the necessity of working to such close limits.

In several other articles we have discussed the effect on price of form, color and finish of production equipment. While it is true that such luxuries, if that is what they are, may be absorbed to a considerable extent without increasing the user's production cost, it is still a fact that the emphasis upon good appearance—eye appeal—does tend to increase the price of the machine at least in some cases. Eye-appeal is demanded by the automotive industry and for good reasons. Even if it increases the price of the tool somewhat it may be justified.

So much for the more or less uncontrollable elements in the establishment of prices. In looking for something tangible which the automotive industry itself can do to place the calculation of machine tool prices on a sounder basis, we can find plenty of evidence that the prices of these tools, as now established, include a burden due to many special services. Take, for example, such charges as:

1. Engineering cost on the design of tooling for new machines.
2. Engineering service in the design of tooling for old machines.
3. Demonstrators.
4. Engineering expense on bids.

Of course, it's human nature to expect a bargain, and those, who take advantage of these services without paying for them directly, may think that they are free. But are they? As a matter of fact, the cost of all such services, as well as any and all price concessions have to be paid by somebody if the seller is to remain in business. What actually happens is that the cost of special services is spread over the entire line of machines and everybody has to foot a part of it.

Can the buying and selling of machine tools and incidental service be placed on a new basis which would make each machine carry its proper share of the burden? Doesn't it seem reasonable that ultimately this arrangement would make for definite economy to the buyers of machine tools? One of the proposals concerns the adoption of a standardized contract form which would give quotations on new equipment in the following fashion:

1. Base price of the machine.
2. Separate price for tooling.
3. Service charge for set-up and demonstration.

Is it too visionary to think that the buying and selling of machine tools and incidental service can be placed on a new basis which would make each machine carry its proper share of the burden? Doesn't it seem reasonable that ultimately this arrangement would make for definite economy to the buyers of machine tools? As a matter of fact, several large automotive manufacturers have given this suggestion a lot of serious consideration. One of the proposals concerns the adoption of a standardized contract form which would give quotations on new equipment in the following fashion:

1. Base price of the machine.
2. Separate price for tooling.
3. Service charge for set-up and demonstration.

Like any other new idea, this one may be hard to accept at the start. But it certainly is well worth trying out, and when some of the larger manufacturers have taken the initiative in this direction, many others unquestionably will fall in line.

Certain changed conditions seemingly make it more difficult today to replace old, worn-out or obsolescent manufacturing equipment. Among these we might mention low labor rates, surplus floor space, and high book value on old equipment. How many of these factors will remain with us permanently is a moot question at the moment.

However, even now, adjustments are being made in space charges. For example, in a number of instances buildings or departments have been abandoned or actually razed in order to cut down the burden of taxation on unused floor space and equipment. Such moves tend to place floor space at a premium again and to restore the importance of increased productivity in determining the value of new equipment.

Furthermore, where low labor rates make it difficult to amortize new equipment, rehabilitation may become unavoidable where new standards of surface finish and closer manufacturing tolerances are demanded.

Fortunately for everyone concerned, the current crop of machine tools possesses the very features which define a profitable investment. As a rule the new machine tools possess great flexibility and universality of application. It is no longer a matter of investing a lot of money in equipment for the production of a given model and then having to scrap practically all of it just as soon as a new model is introduced. For the most part, the new machines are of unit construction and, consequently, can be adapted to widely varied changes in product design by replacing only a few units, the cost of retooling for a new model being confined to a moderate reinvestment in new heads and fixtures rather than extending to a

100 per cent replacement of machines.

Accordingly, the new machine needs no longer be penalized by the requirement that it must pay for itself within one or two years. That was all right in the days of special single-purpose machines which practically had to be junked with a change in product design. But is there any logic in such a requirement when so many things have changed?

Recently we have spoken to a number of plant managers who feel keenly the need for new manufacturing equipment in their plants. They are faced with the obstacles we have just discussed. It is difficult for them to justify a new machine when, through a bookkeeping system which does not accord with amortization requirements at the time of purchase, the old obsolescent equipment is carried at ridiculously high asset values. If this book value were written down, at least in line with present replacement prices, it would be so much easier to justify the purchase of the much needed and much more efficient equipment.

Incidentally, isn't the question of price largely subordinate to the yardstick of productivity mentioned earlier? Productive equipment is self liquidating and can prove its worth by simple arithmetic. But there are other attributes of the machine which are of much greater importance—such as assured productivity, maintenance of tolerance and finish, continued performance, etc. Because of these factors, automotive executives have been willing to pay a higher price for equipment that earned its keep. Lower price will not compensate for machine breakdown, or rejections, or high maintenance costs.

In any general drive on production equipment prices, our industry would be setting up three risks. The first of these is the effect that such a move would have upon the purchasing capacity of the country, for the automotive industry is an important factor in this respect. The point here is that few, if any, equipment manufacturers are now operating on a profit basis. Further demands for reduced prices would have to be met by cutting wages. Unfortunately the tendency today to force action along this line, extending as it does through a widening circle has increasingly disastrous effects on purchasing power.

The second risk is that price reductions may seriously hamper the effectiveness of, and perhaps even put out of business, some of the machine tool organization whose engineering service has been an important factor in the rise of the automotive industry. From the very beginnings of our industry, progress has depended to a large extent upon the concurrent development of production equipment.

Car Makers Need Service as Never Before

Machine tool makers have built up organizations of skilled designers, inventors and mechanics whose efforts have been directed toward the improvement of manufacturing processes. Now, as never before, their cooperation and service are urgently needed in the competitive struggle for automotive markets. Obviously, these manufacturers can't exist—certainly can't continue to provide the needed engineering service—unless they can operate at a reasonable profit.

The third risk is that wherever price is set up as a hurdle there is a danger that industrial rehabilitation will be retarded. Surely this cannot be tolerated at a time when so much depends upon low cost, but profitable operations.

This brief analysis serves to bring to the surface a number of

more or less controversial questions that must be considered by the buyer of machine tools. The stage is all set for a cooperative movement that should be of real benefit to those who participate. The value of the engineering service of the machine tool industry cannot be overestimated. Particularly at the present time it is too great to be jeopardized or hamstrung. Yet, it is obvious that the organizations which provide this service cannot carry on with the same efficiency, with the same aggressiveness, unless they are enabled to sell their products at prices which will yield reasonable profits.

Perhaps one of the most constructive moves in this direction is that which has to do with service charges. Why not spread the cost of service where they belong, and let those who demand more service pay for it? In the long run this should have the effect of placing the selling price of productive equipment on a sounder basis. In fact, it has been suggested by some machine tool builders that this move may ultimately help reduce the price of the standard or universal type of machine. This kind of equipment now carries its portion of the total overhead burden and those who don't need service at all are carrying a part of the cost imposed by the buyers of special machines.

Increased Automobile Tariff Threatens Austrian Market

REPORTING on automobile conditions in Austria, N. S. Automotive Trade Commissioner I. H. Taylor writes from Vienna that there are ever increasing evidences of the unfavorable position in which the Austrian automobile industry finds itself. With exports brought almost to a standstill by conditions in surrounding markets, which none of the frequently revised compensation trade agreements have alleviated, and home demand hardly sufficient to keep one small producer reasonably well occupied, the outlook is anything but bright. With the principal producing combine, Steyr-Austro-Daimler-Puch, virtually under government control through its relation to the Credit-Amstalt which, in turn, represents a heavy liabil-

ity to the central government, support is given to the continuance of the rumors that whatever steps appear necessary will be taken in 1933 to maintain the local industry. The popular belief is that the import quota, now 170 units per country, will be further reduced or eliminated and that tariff schedules in the future will be greatly advanced.

The situation with Steyr is evident from the fact that in their automobile, small arms and bearing plants the number of workmen enrolled is reported to total but 900, and many of these are idle two or three weeks of each month during which periods only about 200 men are working. As recently as 1930 this plant group was employing 3000 workers.

Our Industry's Contribution to

WHEN the gates of A Century of Progress swing open in Chicago on May 27 visitors will find that the automotive industry is one of the major exhibitors.

The automotive industry dominates the south end of the Exposition. The Travel and Transport building and the General Motors and the Chrysler buildings are the most prominent features at that part of the exhibition grounds. Between this group and the northern end, which contains the administration group and hundreds of other exhibits, are the exhibits of

many other automotive manufacturers.

Perhaps the outstanding automotive features of the 1933 World's Fair are the General Motors and Chrysler buildings. The General Motors structure towers 177 ft. and is modernistic in design. It is an eighth of a mile long and 306 ft. deep. The front is almost entirely of plate glass. Aluminum, red, blue and orange make up the color scheme and the building at night will be flooded with rainbow lights. The visitor enters a lofty, pillared hall, in which stands an heroic sculpture of a skilled workman by

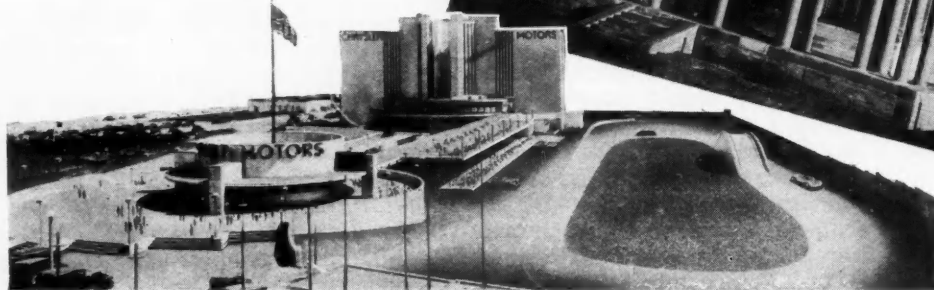
Carl Milles of Sweden. A mural painting covering 1620 sq. ft., by the Mexican painter Diego Rivers, forms a background for this 16-ft. statue. Mural marquetrys and dioramas of the automotive industry are to be seen farther in the entrance hall. The hall divides into two main display rooms, to the right and left. Each room contains 1800 sq. ft. of space in which will be found the latest models of the corporation's cars and the display of the General Motors Research Laboratory.

To the rear of the display rooms and entrance hall a balcony accommodating 1000 people gives an unobstructed view of a complete General Motors assembly line. Even the annealing and spraying booths are roofed with glass so the work inside may be observed. A visitor may select materials for his car,



The replica of the Golden Temple of Jehol can be seen through the generosity of Vincent Bendix. It represents the work of North Chinese architects and was shipped to Chicago in 28,000 pieces. Within are images of Buddha and other Lama gods, incense burners, prayer wheels and other interesting paraphernalia of this ancient religion

The exhibit of Chrysler Motors covers seven acres, including a revolving cyclorama at the main entrance and a quarter-mile hard-surface track



to a Century of Progress

watch it made and drive it away himself.

Behind the assembly line are two double-decked halls for the display of General Motors trucks and products other than passenger cars.

Mural paintings of the 48 States surround the assembly line hall and a sound moving picture theater with seating capacity for 235, rest rooms and lounges is incorporated in the structure. On one side the building may be entered from approaches which connect with docks at the rear by means of which lake steamers may bring visitors directly to the building.

Across the main drive of the fair grounds stands the Chrysler exhibition group. It contains a main display area, known as Walter Chrysler Hall, an observation deck opening from the entrance building and a quarter mile outdoor testing track. Sound motion pictures will illustrate methods of manufacture and there will be exhibits of motors and other parts, body construction and complete chassis. A long, landscaped court with a garden pool surrounded by stainless steel umbrellas will form

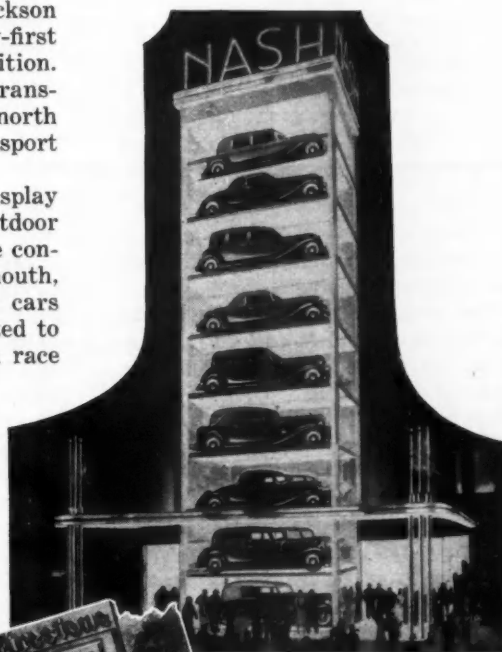
The exhibits of automotive manufacturers at the Chicago World's Fair

a foreground setting for the group of buildings.

The Chrysler Motors buildings are located at the junction of Thirty-first Street and Lief Erickson Drive, just inside the Thirty-first Street entrance to the exposition. They are in the center of the transportation group immediately north of the Travel and Transport building.

A unique feature of the display will be the quarter mile outdoor track upon which there will be constantly from 10 to 20 Plymouth, Dodge, DeSoto and Chrysler cars in which visitors will be invited to ride. In addition, well-known race

drivers and a staff of expert drivers from the Chrysler experimental department will give demonstra-



The Firestone Building is of modern design with one story and a mezzanine. There will be here a complete tire factory in operation

The General Motors Building is the tallest at the Exposition and houses exhibits of the several lines as well as a complete assembly line for the Master Six Chevrolet



The Nash Tower was erected by the Whiting Corp. and consists of column with Nash cars moving up and down behind plate glass sections under novel floodlighting effects



Automotive Exhibitors of A Century of Progress

Ahlberg Bearing Company
 Alemite Corporation
 Aluminum Company of America
 American Bosch Magneto Corp.
 American LaFrance & Foamite Corp.
 American Steel Foundries
 Auburn Automobile Co.
 Bakelite Corp.
 Bausch & Lomb Optical Co.
 Bendix Aviation Corp.
 Borg-Warner Corp.
 Bosch, Fr. E. (German)
 Chicago Flexible Shaft Co.
 Chrysler Sales Corp.
 Clark Tractor Company
 Copper & Brass Research Asso.
 Cord Corp.
 Corning Glass Works
 Crowe Name Plate & Mfg. Co.
 Cutler-Hammer Co.
 DeLaval Co.
 Dow Chemical Co.
 Edison, Thomas A., Inc.
 Electric Storage Battery Co.

Fansteel Prods. Co.
 Firestone Tire & Rubber Co.
 Formica Insulation Co.
 Foxboro Co., The
 General Electric Company
 General Motors Corp.
 General Steel Casting Corp.
 Gulf Refining Co.
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 Indian Refining Co.
 Inland Steel Co.
 International Harvester Co.
 International Nickel Co.
 Johns-Manville Corp.
 Johnson Motor Company
 Link-Belt Company
 Mallinckrodt Chemical Co.
 Master Lock Co.
 Metal & Thermo Co.
 Nash Motors
 National Advisory Committee for Aeronautics

New Jersey Zinc Co.
 Packard Motor Car Co.
 Pure Oil Company
 Simoniz Co.
 Sinclair Refining Co.
 Standard Oil Co. of Indiana
 Stewart-Warner Corp.
 Studebaker Corp.
 Taylor Instrument Companies
 Timken-Detroit Axle Co., The
 Timken Roller Bearing Co.
 Texas Company
 Tinius Olsen Testing Machine Co.
 Union Carbide & Carbon Co.
 Union Switch & Signal Co.
 United Aircraft & Transport Co.
 Van Cleef Bros.
 Walker Vehicle Company
 Waukesha Motor Company
 Wayne Pump Company
 Weidenhoff, J., Inc.
 Westinghouse Air Brake Co.
 Westinghouse Electric & Mfg. Co.
 Whiting Corp.

tions of the performance ability of the Chrysler products.

The oval track is 18 ft. wide at its narrowest points and 40 ft. wide at the turns which are banked for high-speed driving. On the west straightaway there is a by-pass leading to a ramp 100 ft. long and 25 ft. high at the center, which gives an available grade of 25 per cent and provides facilities for the demonstration of hill-climbing ability. The east straightaway has a similar by-pass providing cars to run across an incline the same length as the ramp, at an angle of 45 deg. In the main building there will also be facilities for wind and weather tests to be conducted in glass walled, refrigerated inclosures.

Nash Motors will present one of the most striking of the outdoor exhibits in the transportation group. A glass tower, bathed in light at night, will form its central feature. The Whiting Corporation, cooperating in the exhibit, is erecting the tower for parking. It is 80 ft. high and houses 16 cars, each car pocket having a plate glass front. Nash cars will pass up and down the tower continuously and will also be exhibited in showrooms at the base of the structure.

Another prominent separate display allied with the automotive industry will be the giant thermometer erected by the Indian Refining Company. It will be 200 ft. high and will record the temperature in large figures. The thermometer is

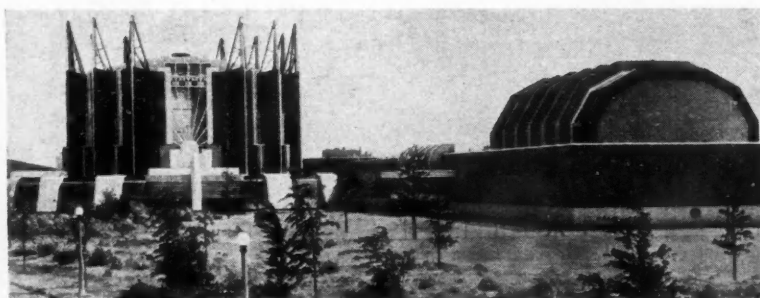
erected on a base structure which will contain displays of the company.

Vincent Bendix's notable contribution to the fair is a replica of the Golden Temple of Jehol, celebrated Chinese Lama Temple. It was duplicated from the original by Northern Chinese artisans, shipped in 28,000 pieces to Chicago and put together again by Chinese workmen under the supervision of Dr. Sven Hedin.

The greater number of individual automotive exhibits are contained in the Travel and Transport building. This building has a dome, suspended by cables from 12 pillars, 125 ft. above the floor. The unobstructed dome space is 206 ft. in diameter and the available display space below it measures 310 ft. across. Besides this main area, there is a huge display hall extending from the dome section.

Upon entering the building the visitor will be confronted by a seemingly endless stretch of mural paintings, animated dioramas, miniature railway systems in operation and displays of the latest developments in transportation. Thirty feet above the floor level under the dome will be a ring of motion picture screens making a 630-ft. panorama which is the exhibit of the Standard Oil Company of Indiana.

(Turn to page 622, please)



Travel and Transport building which houses a majority of the automotive displays

JUST AMONG OURSELVES

Inevitable Peaks

AS discussion of the 30-hour-week bill and minimum wage legislation continues, a statement made last January by K. T. Keller comes to mind as being a pertinent exposition of a thoroughly sound viewpoint for management.

"An intelligent handling of program, production and employment," Mr. Keller said, "in times like these is essential.

"Care must be exercised not to over-expand a working force for what is known in advance to be a very short period of stressed production. I prefer to look at individual employment from the standpoint of the earning hours our employees enjoy over a period of a year.

"No one can successfully deny that our production is seasonal, and as such is bound to experience peak working forces and subsequent lay-offs. Varying the hours of work plus intelligent production control should cut down the peaks and reduce the extent of the lay-offs."

* * *

One for All and—

WE talked with the manager of a big parts plant recently who actually had experience with the share-the-work idea—the idea which the Black bill incorporates in a specific formula. Whatever may be the social benefits of the plan, this manager is prepared to prove its potency in increasing costs and decreasing efficiency by very detailed charts and figures.

He went into the share-the-

work plan, moreover, in a whole hearted manner and with a real desire to make it work in the best possible manner. He later abandoned it, partly for the reasons mentioned and partly because of its unfavorable effect on the morale of the best men in his regular working force whose already low earnings were further depleted.

Interestingly enough, this particular manager is by no means unalterably opposed to the Black bill. He says it is quite conceivable that its social and general economic benefits could outweigh its disadvantages. At least if everybody's costs were higher, he points out, the individual plant wouldn't suffer in the way that his did when he tried the share-the-work idea.

* * *

How High Is Up?

THIS thinking, incidentally, ties in rather well with the ideas expressed by Alfred P. Sloan recently when he appeared before the House Committee on Labor as representative of the N.A.C.C. He said that a minimum wage is a necessary corollary of restricted hours even though in certain instances it would increase costs and hence selling prices.

He opposes legislation such as the Black bill as permanent law, favoring it only as an emergency measure.

All of which brings to mind a simple calculation which, we think, makes an interesting commentary on the practical feasibility of the 30-hour-week bill. It is scarcely conceivable that any minimum wage legislation

passed would result in an average wage for productive workers of more than 75c an hour. A man employed regularly for 30 hours a week, 52 weeks a year, at 75c. an hour would earn \$1170 a year.

* * *

Big Consumer Ads Questioned

SIGNS point to a definite change in attitude toward advertising expenditures on the part of executives high in the automotive industry. The potency of advertising designed to dominate and overwhelm prospects by sheer volume and power is beginning to be doubted seriously, gossip says. There isn't any revolt against advertising in itself, so the story goes, but a strong one against too lavish a use of space in consumer media.

The public is fully conscious today, some of these executives are saying, of who pays the cost of overwhelming space. It is possible for a manufacturer to do himself harm rather than good by too lavish a use of consumer space, some of them are concluding. Moreover, several campaigns which have been long on ideas and short on space volume are said to have brought kind words from bankers in recent months.

One manufacturer finds on investigation that the public is eager for advertising which will help it in its task of buying. As a result he conceives the possibility of a new approach to the whole advertising scheme so far as his organization is concerned. He thinks that perhaps advertising should be conceived as a reader or consumer service rather than as an attempt to dominate consumer thinking.

Whatever may be the exact attitude of any particular company or executive, there is little doubt that automotive advertising expenditure and copy is in process of more critical examination than at any time in the past.

—N. G. S.

Stroboscope Confirms Pulsations in Fuel

System as a whole, not just pump action, determines injection characteristics, British investigators find

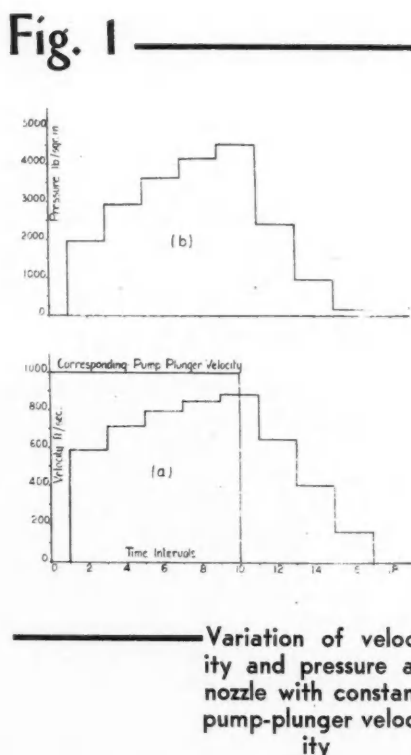
MUCH new light is thrown on oil-injection phenomena by a paper on "An Investigation of Flow in Oil-Engine Injection Systems" which was contributed to the proceedings of the Institution of Automobile Engineers by Dr. S. J. Davies and Dr. E. Giffen, and printed in the April issue of the *Journal of the Institution*. Drs. Davies and Giffen present numerous diagrams in which the instantaneous pressure at the nozzle and velocity of the oil jet are plotted against the crank angle, a first series of such diagrams being based on theoretical considerations, while a second series represents the results of actual measurement. The diagrams of each series differ from each other in that the pump-plunger motion, the pump-shaft speed, and the pipe length were varied. Three types of plunger motion were considered—constant, uniformly increasing, and uniformly decreasing.

In the introduction of the paper it is stated that in any rational treatment of the subject of the hydraulic conditions in the injection system, account must be taken of two basic principles: First, that any change of pressure at a point in the fluid is propagated to all points in the fluid with the speed of sound in that fluid, so that, if a change of pressure takes place in the fluid at one end of a pipe—caused by the motion of a pump plunger, for example—this change of pressure travels to the other end of the pipe—the fuel nozzle—in

the form of a wave having the velocity of sound. A definite interval of time must elapse, therefore, between any action at the pump and the resulting action at the nozzle, this time depending on the length of the pipe. The velocity of sound in the fluid depends only on the density ρ and the compressibility of the fluid—

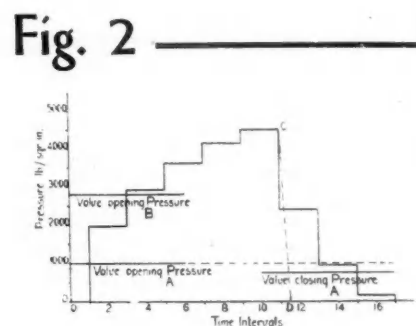
$$V_s = \sqrt{K g / \rho},$$

where K is the bulk modulus of



elasticity or the reciprocal of the compressibility.

Secondly, if at any point in the fluid there is a change of velocity, a corresponding change occurs in the pressure, this change of pressure being propagated through the



fluid with the velocity of sound. The following relation then holds:

$$\frac{\text{Change of velocity}}{\text{Change of pressure}} =$$

$$\frac{\text{Bulk modulus } K}{\text{Speed of sound } V_s} = \sqrt{K \rho / g}$$

Under the conditions prevailing in most injection systems, all of the factors under the radical sign are practically constant, hence changes in pressure and velocity are directly proportional.

In the case of an injection line, a steady flow may be considered to be taking place through a pipe, and this flow is interrupted by the sudden closing of a valve. The effect is that the fluid, by virtue of its momentum, builds up a pressure at the obstruction, which travels backward through the fluid as a wave, as successive sections

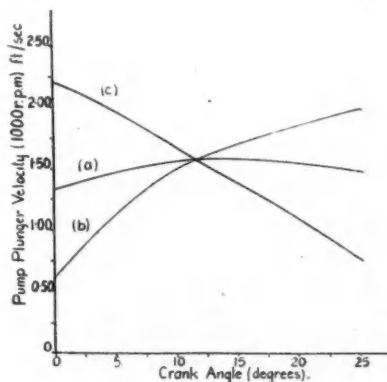
Theory of Pressure Injection Lines

of the fluid change in momentum. The change so brought about is dependent only on the change of velocity. A similar effect, on a reduced scale, is produced if the valve is only partly closed.

In the fuel system, momentum is imparted to the oil by the pump plunger, the pressure wave traveling toward the nozzle. If the nozzle remains closed, the wave will be totally reflected and will travel back toward the plunger, the increase of pressure caused by the reflected wave being equal to that caused by the forward wave. If the nozzle is open, the pressure wave will be partly reflected and the increase of pressure due to the reflected wave will be less than that due to the forward wave.

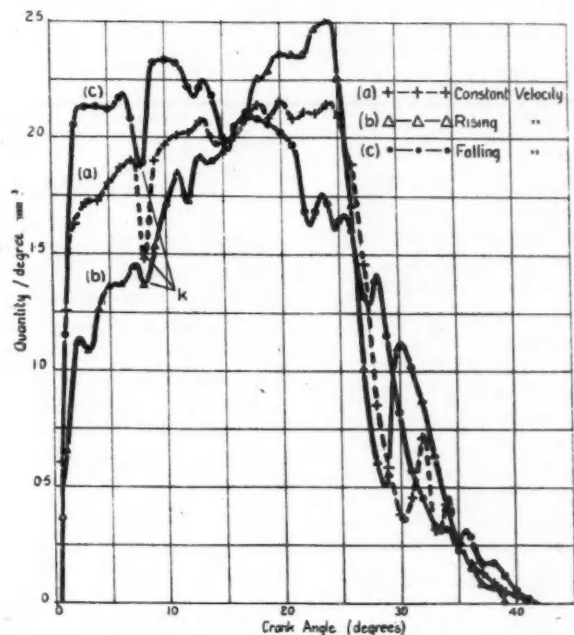
Forward motion of the pump plunger reduces the volume between the plunger and the nozzle, and thus tends to increase the pressure, while flow through the nozzle tends to decrease the pressure. Pressure conditions in the system at any instant depend on the volume of the system and the mass enclosed in this volume, the relationship being—

Fig. 3



Pump plunger velocities in experimental research

Fig. 4



Injection characteristics with different cams

$$\frac{\text{Increase of pressure}}{\text{Specific decrease of volume}} = K,$$

the bulk modulus of elasticity.

It is pointed out by the authors that the criterion of a successful injection system is the degree of control possible over the timing and rate of injection, and for that reason curves showing actual rates of injection were made the basis of comparison in their investigation. In their calculation of jet velocity and nozzle pressure they assumed the following simple conditions:

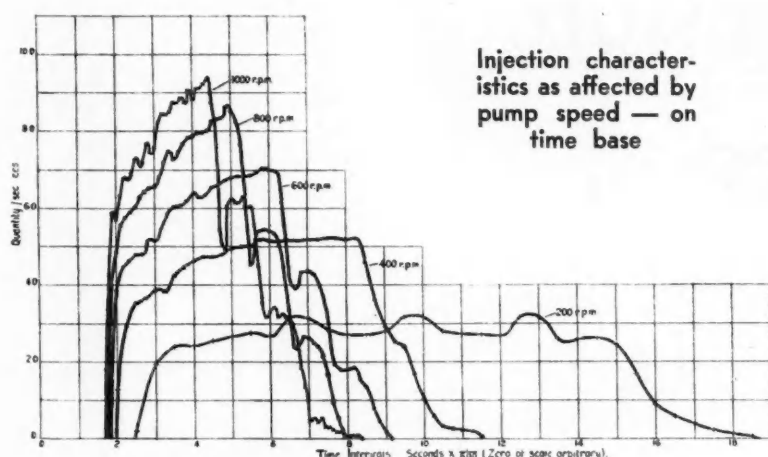
Simple open nozzle of effective cross section one-fortieth that of the pipe, injecting into the atmosphere; area of pump plunger twenty-five times the cross section of the pipe; pump plunger moving with uniform velocity of 1 ft. per

sec.; time of delivery by pump, 0.004 sec.; instantaneous beginning and end of delivery at pump plunger; bulk modulus of oil in pipe, 266,500 lb. per sq. in.; specific gravity of oil, 0.86; corresponding speed of sound in pipe, 4800 ft. per sec.; length of pipe, 23 in., which makes the time required for a disturbance to travel along it,

$$23 / (12 \times 4800) = 0.0004 \text{ sec.},$$

or one-tenth the period of injection. Except that it is impossible to start and stop injection absolutely instantaneously, all of the conditions assumed are easily obtainable in practice. Closing of the pump suction valve and opening of the release valve both require a finite time, and the shorter these time in-

Fig. 5



tervals can be made, the more rapidly the pressure will be built up at the beginning of the delivery period, and reduced at release. The pressures in the pipe during the periods of succeeding pressure waves are now calculated as follows:

With a plunger velocity of 1 ft. per sec., the corresponding velocity in the pipe is 25 ft. per sec., and the magnitude of the pressure wave required to initiate this flow velocity in the pipe is

$$P = (K/V_s) \times \text{increase of velocity in pipe} \\ = (266,500/4,800) \times 25 = 1,388 \text{ lb. per sq. in.}$$

This increase of pressure is propagated along the line with the velocity of sound and reaches the nozzle after an interval of 0.0004 sec. With the open nozzle, injection begins immediately, and the reflection of the wave is only partial, due to the loss of momentum represented by the jet. The pressure of the reflected wave is found as follows:

The total pressure at the nozzle after reflection is $1,388 + P_r$, and the velocity through the nozzle therefore is

$$V_n = \sqrt{\frac{2g(1,388 + P_r)}{\text{density}}} \\ = \sqrt{\frac{2g(1,388 + P_r) 144}{0.86 \times 62.4}} \\ = 13.14 \sqrt{1,388 + P_r}$$

The corresponding velocity in the pipe is

$$V_p = V_n/40 = 0.3285 \sqrt{1,388 + P_r}$$

Now, the reflected wave P_r is proportional to the reduction of velocity in the pipe from 25 ft. per sec. to V_p , so that

$$P_r = (K/V_s) \times \text{change of velocity} \\ = (K/V_s) (25 - V_p) \\ = (266,500/4,800) \\ \times (25 - 0.3285 \sqrt{1,388 + P_r})$$

which gives

$$P_r = 579 \text{ lb. per sq. in.}$$

This makes the total pressure at the nozzle

$$1,388 + 579 = 1,967 \text{ lb. per sq. in.}$$

This reflected wave now travels back toward the pump plunger, and the conditions at the nozzle remain constant until this wave, which is completely reflected at the pump, again reaches the nozzle. This complete reflection at the pump is due to the increase in the velocity of the oil at this end of the pipe from V_p to its initial velocity of 25 ft. per sec., resulting from the continued steady motion of the pump plunger. The total pressure in the pipe after the passage of this completely reflected wave from the pump to the nozzle is now

$$1,967 + 579 = 2,546 \text{ lb. per sq. in.}$$

On the arrival of this wave of 579 lb. per sq. in. at the nozzle, the magnitude of the next partially reflected wave is found by a calculation similar to that given in the foregoing, and amounts to 400 lb.

per sq. in. In this manner the pressure increase and velocity increase for each interval of 0.0004 sec. are calculated. The delivery period covering ten such intervals (ten times 0.0004 sec.), at the end of the tenth interval delivery into the pipe ceases, and the wave reaching the pump end of the pipe at this instant is not reflected. Instead, the oil at this end of the pipe is brought to rest, and a negative wave of 1226 lb. per sq. in., brought about by this change of velocity, assumed to be instantaneous, is now propagated toward the nozzle. When this negative wave reaches the nozzle it is partially reflected as before, still further reducing the pressure in the pipe. This continues until the pressure at the nozzle and in the pipe falls to that of the atmosphere, which in the case under consideration requires seven intervals more.

From the figures thus obtained the diagrams of Fig. 1, of pressure and velocity at the nozzle, were constructed, both on a base of time. It will be seen that the velocity at the nozzle never quite equals the "corresponding pump-plunger velocity," that is, the actual velocity $\times 25 \times 40$; but, of course, the area under the nozzle-velocity line is equal to that under the "corresponding plunger velocity" line, since the discharges of the pump and the nozzle are the same. The lower rate of delivery from the nozzle is compensated for by the longer duration. It will also be noticed from the diagram that delivery from the nozzle does not begin at once, but only after the first pressure wave reaches the nozzle, in this case after an interval of 0.0004 sec., which is called the injection lag.

In the paper, diagrams of nozzle velocity and nozzle pressure are also given for cases in which the plunger velocity, instead of being constant, increases and decreases at a uniform rate, respectively. The resulting pressure and velocity graphs are quite similar to those of Fig. 1, except that in the first case (uniform increase of plunger velocity), those portions of the graphs which correspond to the period of pump delivery and which are horizontal in Fig. 1, slope upward moderately, while in the second case they slope downward. As would be expected, the portions of the graphs beyond the point of cut-off are not affected by the characteristics of plunger motion.

When fuel is delivered against back pressure, the rate of delivery

is decreased and is dependent upon the difference between the nozzle pressure and the back pressure, instead of on the nozzle pressure. In taking account of this effect in their diagrams, the authors assume that the back pressure increases during the injection period in steps, from 300 to 800 lb. per sq. in., and that it is constant during the time interval corresponding to the passage of the pressure wave from one end of the line to the other. It is seen that the back pressure changes the injection velocity and the nozzle pressure relatively little, the changes not being of an order to affect any conclusions concerning injection characteristics based on the assumption of atmospheric back pressure. On the other hand, it is well known that the back pressure has a marked influence on the behavior of the fuel after leaving the nozzle.

Graphs of velocity and pressure were drawn also to show the effect of pump speed, a velocity graph for twice normal speed being superposed on one for normal speed. These graphs were drawn on a base of time and also on a base of crank angle. There is no change in the injection lag with speed on the basis of time, but on the basis of crank angle the injection lag varies in proportion to the speed. On a time basis there is not much difference between the total periods of injection with the two different speeds, the total period being

slightly greater at normal speed; but on a crank-angle basis the total injection period is much longer at twice normal speed, owing to the fact that the release of pressure at the nozzle after pump delivery has ceased is independent of engine speed.

Another diagram in the paper shows the effect of variations in pipe length. As would be expected, the injection lag increases in direct proportion to the pipe length; the maximum velocity approaches the corresponding velocity of the plunger more closely the shorter the pipe, and the total time of injection increases with the length of the pipe, because the decrease in pipe pressure is slower with a long pipe.

The effects of substituting a spring-loaded valve for the open nozzle were also considered; and the diagram obtained is reproduced in Fig. 2. This shows the curve Fig. 1 (b) for the open nozzle on which two different settings (A) and (B) of the valve spring are indicated. With setting (A) the valve will open on the arrival of the first pressure wave, even from an initial pressure equal to atmospheric, and if it be assumed that the valve rises instantaneously to its full lift, injection will proceed normally. In this case the initial wave without reflection is sufficient to open the valve, and a vertical wave front is assumed.

With a setting such as (B) vari-

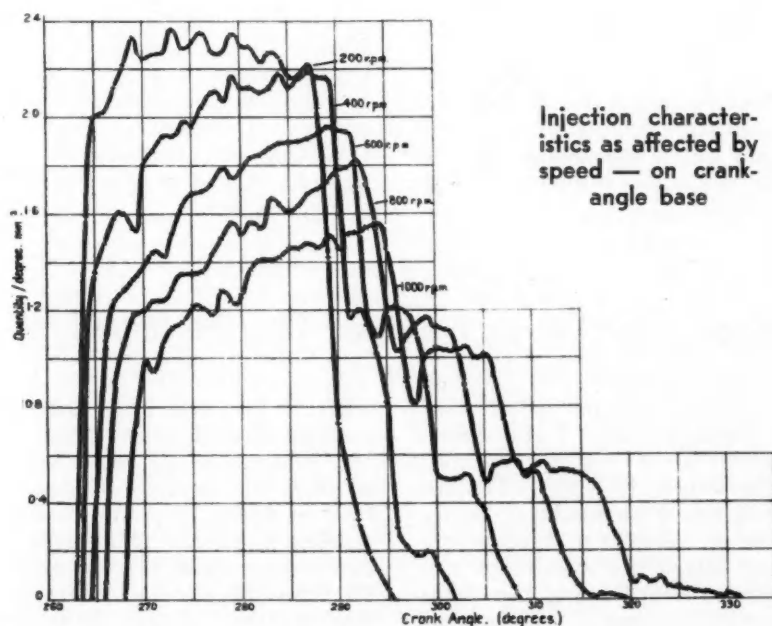
ous conditions will control the opening. If the initial or static pressure in the pipe be high, instantaneous opening may follow the arrival of the first wave, as above. If the magnitude of the first wave in itself is not sufficient, the wave will be completely reflected, giving double the pressure behind the nozzle. If this exceeds the opening pressure, the valve will open, flow will take place through the nozzle, and as a result there will be a corresponding fall of pressure at the nozzle. As a rule, the flow will continue, but the fall in pressure may be so great that the valve may close again and remain closed until the arrival of the next wave.

With direct opening on the arrival of the first wave, assuming the sloping wave front, the injection lag is the sum of three time intervals: The first is that (already considered) which results from the propagation along the pipe; the second is that time, after the arrival of the wave front, during which the pressure increases to the opening pressure; the third is the finite time required to overcome the inertia of the valve. If some reflection of the first wave is necessary before opening takes place, the second of these intervals is correspondingly increased. Again, if total reflection occurs without opening the valve, then the first of the intervals is doubled. The injection lag with a spring-loaded valve is thus always greater than with an open nozzle.

In the experimental work carried out by Drs. Davies and Giffen a slot of definite width (1 deg.) in a disk rotating at pump-shaft speed was caused to pass across the path of the jet leaving the nozzle. The fuel injected while the slot passed the nozzle was collected in a suitable vessel for measurement. By progressively altering the angular position of the disk relative to the pump shaft, the particular phase angle at which the fuel was collected could be varied over the complete injection period. In this way a curve of injection per degree of pump angle could be plotted on a base of pump angle, which could be readily converted into a curve of nozzle velocity on a base of time.

All experiments were carried out with the same injection pump, which was of Junkers design, and of the simple plunger type, suction and cut-off being controlled by ports in the pump cylinder. The delivery valve of this pump is of

Fig. 6



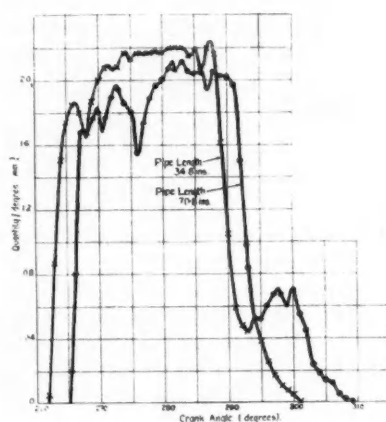
the double-ball check-valve type. The nozzle used was of the open type with a single orifice. The fuel pipes were of steel, with internal and external diameters of 2 and 6 mm., respectively. Three different pump cams were used, giving constant, increasing and decreasing plunger velocities respectively, so that the results could be compared with those arrived at theoretically. The variation of the plunger velocity with the crank angle for the three cams is shown in Fig. 3, while Fig. 4 shows injection characteristics with the different cams. The authors observe that all three curves give satisfactory confirmation of the results arrived at theoretically. The kinks during the pressure rise, as indicated at K, are believed to be due to movements of the check valves at the pump, since they are separated by intervals corresponding to a double passage of the pressure wave. Variations of delivery after cut-off are similar to those anticipated from the analytical investigation. During the pump-delivery period the rate of delivery increases (in steps) even when the pump plunger velocity decreases, while in the case of increasing pump-plunger velocity the jet velocity increases very rapidly.

Figs. 5 and 6 show the effect of speed on the injection. In the first figure the delivery rate (quantity per second) is plotted on a time base, while in the second the delivery rate in quantity per degree is plotted on a crank-angle base. The actual velocity of injection naturally decreases as the speed decreases, the total time of injection increasing simultaneously. On the other hand, the injection per degree of crank motion is highest at low speeds and the angular period of injection is smaller at low speeds than at high.

Fig. 7 shows the effect on injection characteristics of a change in the length of the pipe. It confirms conclusions reached on theoretical grounds, viz., that the shorter the pipe, the earlier will be the beginning of injection, the shorter the total period of injection, and the higher the maximum pressure and velocity at the nozzle.

From all of the characteristic curves obtained it is evident that the complete injection process consists of two more or less distinct periods. The first of these, during which the nozzle pressure is built up to its maximum value, corresponds broadly to the pump-delivery period, while the second is

Fig. 7



Injection characteristics as affected by pipe length — on crank-angle base

that during which the nozzle pressure is released and injection is cut off. The first period determines the conditions of atomization of the main portion of the charge of fuel, and thus the fuel consumption; but the second may, if unduly prolonged, give bad results as regards the state of the exhaust.

The effect of the check valve in the fuel line on the injection characteristics was also investigated. Using a pipe substantially 90 in. long and running the pump shaft at 600 r.p.m., with a check valve at the nozzle end and none at the pump, the rate of injection dropped to zero rapidly after the cut-off, while with this valve removed and the double-ball check valve inserted at the pump end, a pressure wave was set up in the line that was reflected in the graph of the rate of injection, which after dropping to a low value, rose again and was maintained at the higher value for some time.

The following conclusions were drawn from their experiments by Drs. Davies and Giffen:

1. The injection characteristic cannot be inferred directly from pump action, but, since the relationship depends on a number of distinct factors, every injection system must be considered as a whole.

2. Constant delivery from the pump gives, with the usual injection system, increasing rate of injection while the pressure is being built up by repeated wave motion. At the end of pump delivery, the pressure-release period follows, this again being determined by wave action in the system.

3. With increasing pump delivery, the rate of increase of injection is correspondingly greater; with decreasing pump delivery this rate of increase is correspondingly less. With suitable pump-plunger motion any desired injection characteristic may be obtained.

4. Injection lag may consist of three periods; that for the passage of a disturbance along the pipe; that for building up pressure at the nozzle, and that for opening of the valve. With open nozzles only the first applies.

5. A longer pipe involves a greater injection lag. It gives also a lower maximum pressure at the nozzle, a slower building up of pressure, and a relatively much slower release of pressure.

6. A change of speed changes the injection characteristic. A higher speed gives a higher rate of injection, but not in proportion to the increase of speed. The injection lag is the same on time, but proportionately longer on crank angle. On crank angle the beginning of release is roughly constant, but the pressure-release period increases with speed.

7. The pressure-release period depends on the system but not on pump delivery.

Producer Gas Trucks Decrease Despite Subsidy

INQUIRIES made of the chief of the French Motor Fuels Office, Dumanois, show that the number of motor trucks in France that are being operated on producer gas is decreasing, in spite of the encouragement given the system by the Government. Although the total number of commercial vehicles registered in France in 1931 was 437,867, the total number of vehicles

with suction-gas operation never reached the thousand mark. In 1927 there were 281 such vehicles, in 1928, 905, in 1929, 986, in 1930, 879, in 1931, 771, and in 1932 a smaller number. This decline occurred in spite of the fact that the Government pays a premium of 4000 to 5000 francs on the purchase of such vehicles and an annual bonus of from 2500 to 3500 francs.

Car Builders Wary of Advance Buying As Suppliers Ask for Definite Orders

Continued Rise in Material Cost May
Force Car Price Boost by Mid-Year

by Athel F. Denham

Field Editor, Automotive Industries

If raw materials prices continue to increase in the next few months at the same rate as during the past two, motor car manufacturers about mid-summer, if not before, are going to be faced with the necessity of increasing wholesale prices or else be satisfied with a reduced margin of profit for the second half of the year, from all indications.

While it is impossible to obtain a really clear-cut picture of what percentage of car manufacturers' requirements are "protected" against price increases, even a cursory check reveals that such protection certainly does not average more than from 75 to 90 days for the industry as a whole.

During the past few weeks especially, vehicle manufacturers have been faced with a reversal of the usual quotations practices. Bids at low prices are being withdrawn by suppliers in increasing quantities.

It can be said, generally, that the more stable automotive suppliers are following the policy of quotation of flat prices for a period of time exceeding 60 days only where the order is accompanied by a release for a definite amount of material covering such a period. In other words, such suppliers are really taking orders at present prices only on definite quantities of materials and not for a stipulated period of time irrespective of production requirements.

Car manufacturers on the whole have been slow to reverse their usual buying policies in this respect. Advance commitment for definite quantities of materials is still designated by the majority as "speculative buying," lacking a definite knowledge of what the next six months hold in store for the automobile manufacturer. On the whole, the tendency is to be con-

servative rather than optimistic, in spite of the fact that during the past six weeks even the most optimistic of estimates regarding passenger car sales and production have proved too conservative.

It is true that car manufacturers have, for publicity purposes probably, given out statements to the effect that they expect the normal peak for vehicle sales to come later in the season this year than normally. But such public statements are not directly reflected in advance commitments or schedules. On the contrary, virtually every important manufacturer during the past two months, and May bids fair to carry out the same history, has been forced to increase production schedules at mid-month or earlier from those set at the beginning of the month.

Short Orders are the Vogue

While the more stable suppliers, especially of parts, have protected themselves against further increases in raw materials prices by refusing blanket commitments for a period of time, at stipulated prices, a tendency still persists among other producers to take business at any price. However, a tendency has already developed among purchasing agents of some of the larger companies to assign smaller quantities to suppliers whose bids are too far under the market price average, largely as a protection to insure continuous sources of supply, and to avoid the entirely possible cancellation of important quantity contracts by the supplier if raw materials prices reach higher levels in the future.

On the subject of higher motor car prices, considerable discussion has developed in recent weeks around Detroit, but so far apparently no definite action has been

contemplated. One of the major factors preventing such action at the present time is the highly competitive situation in the under \$800 field and the uncertainty existing as to the Ford Motor Company's next move. It is rather generally conceded that the new Ford when announced will carry an appeal based largely on price, but whether the price will be \$50 or can be \$100 under the present eight-cylinder line is a subject of considerable debate.

The general assumption is that Ford will endeavor to cut his price even beyond present profit potential in an effort to regain some of the ground he has lost in the past few years, and will base his hopes for profit mainly on tremendously increased volume at lower gross profit margins.

If such a situation develops it goes without saying that price increases would be much fewer in number and smaller in amount. As a matter of fact further price cuts might even be made by other producers to maintain their competitive position in the market.

The automotive industry during the past few years has begun to realize that total volume of car sales is not materially affected by changes in price structure, and that such changes merely result in the redistribution of percentage of the market among the various producers affected.

A concerted move by all important manufacturers to increase prices today would be received with open arms by the industry, provided it would be accompanied by definite assurance that such increases would be general in character and not invalidated by refusal of one or two important manufacturers to cooperate in putting the industry on a profitable basis.

Shall We Have Production Control

SWEEPING in its provisions, the Industrial Recovery-Public Works bill, introduced Wednesday by Senator Robert F. Wagner of New York, establishes an unprecedented "partnership" of government and business. In order that it might be rushed through at the present session of Congress, hearings were begun on it Thursday before the House Committee on Ways and Means, one objective being to devise means of raising \$220,000,000 to amortize the interest payments and principal of the huge \$3,300,000,000 public works program.

In his message asking for the legislation, President Roosevelt made no recommendation as to the means of raising the revenue, but served notice that if by the beginning of the coming week no form of taxation had been prepared, he would transmit his own recommendations to Congress.

A Labor Bill Essentially

The primary object of the bill is to establish what the President called "machinery necessary for a great cooperative movement throughout industry in order to obtain wide reemployment, to shorten the working week, to pay a decent wage for the shorter week and to prevent unfair competition and disastrous overproduction."

Essentially, it is a labor bill. It is intended not only to restore several million men and women to work, but gives the President tremendous powers to drive the sweatshop out of existence or force it to come up to decent standards of wages and working conditions. To this end it provides for the setting up of agencies by the President through which trade associations in all lines of industry may reach agreements for standards of wages, working conditions and even control of production. Those failing to do so would be penalized; in effect, blacklisted. The anti-trust laws will be suspended to permit this cooperation between the government and industry. As drawn, the bill has a two-year limitation.

by **L. W. Moffet**

Washington Correspondent
Automotive Industries

In brief, that is the essence of the Industrial Recovery Act.

The public works program, which would be operated by a Federal Emergency Administration of Public Works, gives the President power to start a large program of direct employment, running up to \$3,300,000,000, in cooperation with states and municipalities. Highway construction up to \$400,000,000 would be administered through the President in cooperation with the state highway departments. Funds would be allocated to each state to the extent of 75 per cent under the terms of the present Federal Aid Act, and 25 per cent based on populations of the states. This latter arrangement plainly is intended to absorb as much of the large unemployment in the cities as possible. Arterial highways will undoubtedly be constructed by large outlays through cities.

Tax Program

In the matter of the taxation program, the automotive industry, speaking through President Alfred P. Sloan, Jr., president of the General Motors Corporation, and others, have from time to time told committees of Congress that if further taxes are to be assessed, they should be general in character. If possible, they have urged, they should eliminate the existing excise taxes, and certainly not be superimposed on present levies. The motor industry is paying excise taxes of approximately \$200,000,000 and considers that it is bearing an undue burden.

The Industrial Recovery section of the bill, which will replace the Black-Perkins 30-hour bill, proposes cooperative action within industry, under supervision of the

President, to a point never before approached. It authorizes any group or association within a trade or industry to prepare a code of fair competition, fixing standards covering trade and competitive practices within that industry. Such a code must be first submitted to and approved by the President.

Self-Regulation

In his statement explaining the bill, Senator Wagner pointed out that the President may approve such a code if he finds:

1. That the group presenting the code truly represents the trade or industry for which it speaks.
2. That it admits freely to membership all who are engaged in the same trade or industry.
3. That the code of rules is fair to competitors, employees and consumers.
4. That it will not promote monopoly.
5. That it does not oppress or discriminate against small business enterprises.

The code likewise must provide that employees shall have the right to organize and bargain collectively and that the right to join labor organizations will not be interfered with. Employers agreeing to the code must undertake to reduce the hours of labor to that number which the President finds will be "most helpful in increasing employment in the industry." Finally, employers must agree to pay a minimum scale of wages and maintain minimum standards of working conditions as determined by the President. Plainly, organized labor brought about these provisions. Also the President is given an even firmer grip on all industry through imposing a code of fair competition upon any industry unable or refusing to cooperate. In "extraordinary" circumstances, the President can require licenses for trades or industries before permitting them to operate. Clearly, here is a club held over sweatshops and other lines not paying decent wages.

In the Motor Industries?

With output more or less balanced with sales and relatively high standards of wages and working conditions, Industrial Recovery Bill seems unlikely to affect automotive manufacturers materially

As far-reaching as it is, the bill probably in many of its important features will have no bearing on motor, accessory and tire manufacturers, inasmuch as they generally are up to the standards that will be required as to wages and working conditions. Nor does there seem to be any probability whatsoever that a large-investment industry like the motor and related industries will be affected by any plan to control production. Production and demand already are well balanced through dealer organizations.

Shorter Work Week

As to hours of labor, the industries will probably carry on with a shorter work week than the government would like to see, at least until business improves further. Then, it could easily whip itself up to any reasonable limit, though it has objected vigorously to the proposed 30-hour restriction.

The hourly rate of wages in the motor industry is no doubt higher than the government would seek to establish, for it is to be remembered that good wage rate industries, like the motor industry and related units, are not what the government is "shooting at." It is shooting at sweatshops with long hours and scant wages. Unless they toe the mark, they can be dealt with drastically, and even put out of business.

The right of collective bargaining, it is not believed, would affect the motor and affiliated industries, for that right now exists and conditions within these industries are in most cases above the standards set up even by organized labor.

If the motor and related indus-

tries find what they contend are unfair practices within their industries these practices could be eliminated through the code drawn up by responsible trade associations, once the codes had been approved by the President. He would operate through agencies, the precise character of which are not designated by the bill.

It is conceivable that in the matter of control of production, the bill would apply with especial force to the natural resources industries, like coal, petroleum, and lumber. It would apply also to some manufacturing lines perhaps, held to be overbuilt, and it is conceivable that the great iron and steel industry would come in this category, though this is speculative. In any event control of production of these and other lines from which the automotive industries buy materials would have some effect in increasing prices and therefore costs of manufacture in the automotive industries. In such an event, apparently, the automotive industries would have to overcome the bulge in costs through increased efficiency and improved production methods or ask higher prices for their products.

Used Car Trading

The bill is so broad that it is difficult to say how far it may reach. For instance, the point has been raised as to whether through permissible trade agreements, automobile dealers could decide among themselves upon standard trade-in allowances. The point has been raised that the selling operations of dealers are not ordinarily interstate, nor are they manufacturing or producing, yet the bill permits

the President to prescribe and approve a code of "fair competition for such trade or industry or subdivision thereof" which shall have the same effect as a code of fair competition.

Like all other measures, it is clear that the results coming from this revolutionary plan of government-business "partnership" will depend much upon its administration. Wisely administered many industrialists think it will have a tremendously beneficial effect upon restoring prosperity by again building up employment and large purchasing power, the latter raised to a higher level by good wages.

Industry a Pioneer

Incidentally, the automotive industry was the real pioneer in the United States in paying high wages on the sound theory that it built up purchasing power, good for business and good for labor alike. The industry therefore sees the government prepared to enforce what it long has applied and consequently will not be affected by the wage conditions. It does not want production control and it is not thought at all likely it will have to meet that point.

Whatever the consequences of the sweeping legislation, it is certain that to a large degree it proposes exactly what many of those prominent in industry have urged as a means of getting out of the depression. They want to try the new deal and are about to get a chance to see how it works. They have asked for what, in effect, will be a government dictator—a benevolent one, they hope—whether it is called a partnership or something else.

Molybdenum Additions Broaden Cast Iron

WHILE the beneficial effects which additions of molybdenum have on the physical properties of steel have been known for quite a long time, its somewhat similar effects on cast iron have received recognition only recently. Originally molybdenum iron, like other alloyed irons, was used for cylinder blocks, but other automotive applications have been developed since, one of the most interesting being in the manufacture of camshafts. Research into the effects of additions of molybdenum on the molecular structure and physical properties of cast iron have been continued since such alloyed irons were first offered to automotive manufacturers, and to acquaint foundrymen with the most recent progress along this line, the Climax Molybdenum Company of New York has issued a 1933 Supplement to its previous publication on Molybdenum in Cast Iron, on which the following is based.

The improvements in cast iron due to additions of molybdenum are due in part to its effects on the form and distribution of graphite in the iron. Molybdenum, even when added in small proportions, is said to shorten, curl and evenly distribute the graphite. Graphite has no particular strength, and its effect on the strength of cast iron has been explained by saying that it is equivalent to just so many voids in the iron. It will be readily understood that if the "voids" are reduced in size and more evenly distributed, the effect on the strength of the iron is reduced.

On the matrix of the iron the molybdenum has a dual effect, in that it forms a solid solution with the

ferrite and in addition enters into chemical combination with the carbides. When properly applied, molybdenum hardens the iron only slightly, but it improves the mechanical properties greatly. Molybdenum ferrite is said to be stronger and tougher, and molybdenum carbide very much tougher than the corresponding constituents of the unalloyed iron. Molybdenum is said to improve any cast iron to which it is added, and it is not necessary that the iron should have a specially low total-carbon content, though the improvement is greatest in irons of that type.

Climax Molybdenum Company manufactures a ferro-molybdenum alloy for addition to cupola iron. It contains from 60 to 70 per cent of molybdenum, very little carbon (less than 0.10 per cent), and 5-7 per cent of silicon in chemical combination. The carbon is held low to guard against the occurrence of carbides that might be insoluble at the temperature of molten cast iron. A high silicon content is provided to facilitate solution of the alloy in the cast iron. Very little cooling effect is noticed when up to 1.5 per cent of molybdenum is

A summary of recent research and progress in use of this important new alloy iron

added to the spout of a cupola or even to a shank ladle. It is stated that the ferro-molybdenum is virtually dissolved in the iron as salt is dissolved in water, rather than being melted. If the iron is at reasonably high temperature—say, 2600 deg. Fahr.—when the alloy is added, no preheating of the latter is necessary.

Ferro-molybdenum can be added to the charges in both air furnaces and electric furnaces, but where plenty of time can be allowed for its decomposition and solution, it is often preferred to add calcium molybdate, for the reason that the cost of the addition is less per pound of molybdenum. The calcium molybdate is preferably buried in the charge of the air furnace or electric furnace, but may be thrown on top of the melted bath two hours or more before the heat is tapped in the case of the air furnace, and one-half hour or more in the case of the electric furnace.

Numerous examples of results obtained from test specimens containing molybdenum, as compared with results from test specimens from the same heat before the molybdenum had been added, are given in the supplement. Thus one rather poor base iron showed a tensile strength of 17,820 lb. per sq. in., and this was raised to 29,370 lb. per sq. in. when ferro-molybdenum was added in the ladle in such proportion as to show 0.47 per cent in the alloy iron. In another case the tensile strength of 25,960 lb. per sq. in. of the base iron was raised to 34,100 lb. per sq. in. by the addition of 0.43 per cent of molybdenum. The base in this case contained both nickel and chromium. The addition of the molybdenum increased the Brinell hardness from 190 to 205. A good cupola iron had its transverse strength increased from 3670 lb. to 4860 lb. by the addition of 0.40 per cent molybdenum, the Brinell hardness being increased from 223 to 235. The increase in the transverse strength is attributed to a more nearly uniform distribution of the chromium

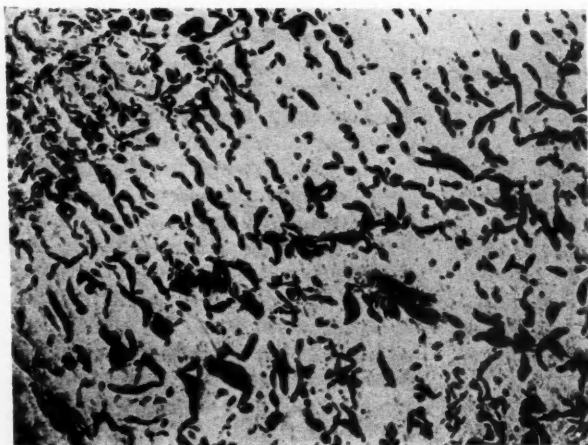
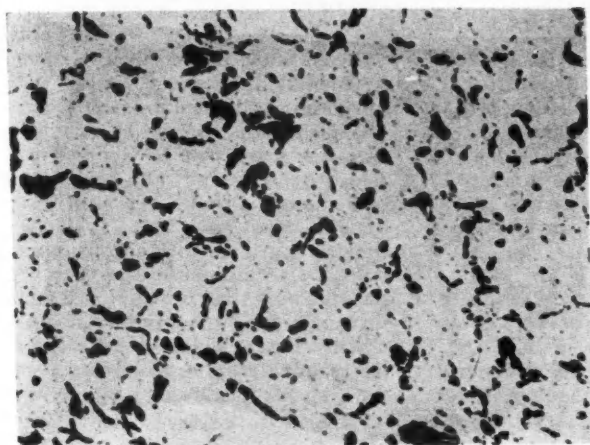


Fig. 1 — Micrograph of unalloyed cast iron. Section unetched and magnified 100 times. A comparison with Fig. 2 shows the effect of molybdenum on the iron matrix and the graphite

Iron's Sphere of Automotive Usefulness

Fig. 2—Microphotograph of molybdenum cast iron section, unetched and magnified 100 times



carbides in the molybdenum iron.

Medium-carbon furnace irons also showed notable improvements when molybdenum was added to them. A plain iron of this type, that is, one without any alloying elements, showed a tensile strength of 39,900 lb. per sq. in. The addition of 0.70 per cent molybdenum and 0.65 per cent nickel raised this to 54,800 lb. per sq. in., while practically the same iron with 1.71 per cent molybdenum and 1.20 per cent of nickel showed 67,000 lb. per sq. in. The Brinell hardnesses of the three samples were 212, 277, and 293 respectively.

A more than 50 per cent increase in tensile strength was obtained in a low-carbon electric-furnace iron by the addition of 0.57 per cent molybdenum and 0.70 per cent nickel—from 39,150 to 60,720 lb. per sq. in. The Brinell hardness was only moderately increased, from 235 to 269.

The claim of greater toughness for molybdenum iron is based on the observation that the deflections are increased when molybdenum is added, even though the transverse and tensile strengths are increased. An increase in strength by almost any other means reduces the deflection.

Test figures obtained by MacKenzie on irons produced by Smith and Aufderhaar indicate that molybdenum greatly increases the modulus of elasticity of cast iron. It is generally known that alloying has little effect on the modulus of elasticity of steel, but in the case of cast iron the finer and more nearly uniform distribution of the graphite brought about by the

addition of molybdenum seems to have an important effect. A chart is given in which the modulus of elasticity is plotted against the molybdenum content. This shows the modulus of elasticity to increase from 6,000,000 lb. per sq. in. for an iron containing no molybdenum, to 12,000,000 for an iron containing one per cent of molybdenum, to practically 18,000,000 for an iron containing 3.2 per cent of molybdenum. It seems to the writer, however, that the figure of 6,000,000 for a plain iron is too low, as this modulus is usually given as 15,000,000 lb. per sq. in.

Molybdenum is used extensively for the purpose of reducing growth in cast iron, and the addition of 0.50 per cent molybdenum is said to have reduced growth as much as 50 per

cent in some cases. A small proportion of chromium is often added also where resistance to oxidation is essential.

Tests to determine the change in the strength of molybdenum cast iron with increase in temperature have been made at the Batelle Memorial Institute. A cast iron containing 0.63 per cent of molybdenum showed a decrease in tensile strength from 43,000 lb. to 39,900 lb. per sq. in. when raised from room temperature to 800 deg. Fahr., one containing 0.83 per cent molybdenum dropped from 59,500 to 52,900 lb. per sq. in. under the same conditions, and one containing 1.58 per cent of molybdenum dropped from 59,800 to 55,100 lb. per sq. in.

Tests by Musatti and Calbiani on the effect of molybdenum on the wear resistance of cast irons are quoted. The tests were made with an Amsler wear-testing machine and the results are plotted as loss of material in grams against thousands of cycles. The results indicate that an addition of 1.0 per cent of molybdenum re-

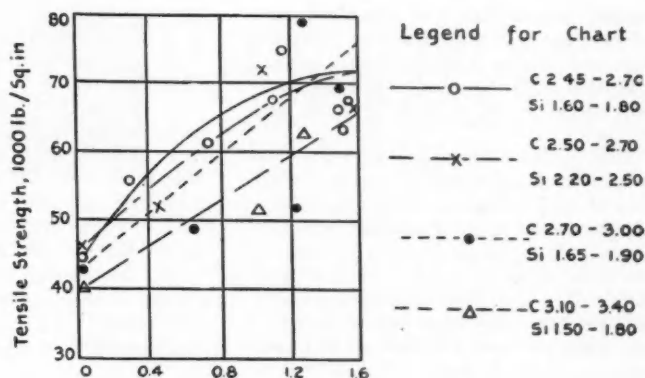
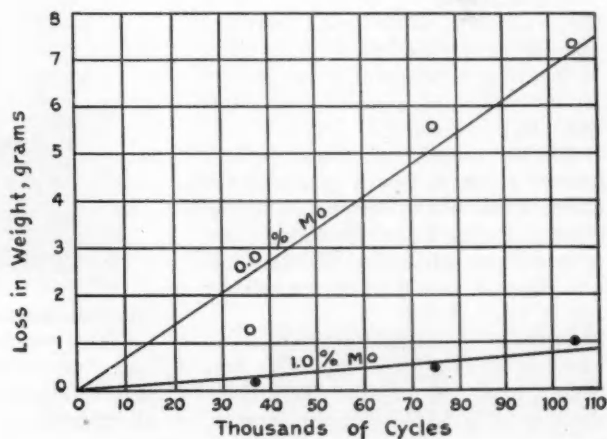


Fig. 3 — Effect of molybdenum in raising the tensile strength of cast iron (From tests by Musatti and Calbiani)

Fig. 4 — Relative wear of plain cast iron and an iron containing 1.0 per cent of molybdenum (From tests by Musatti and Calbiani)



duces the rate of wear to nearly one-tenth.

Molybdenum also increases the impact strength of cast iron. As there is no standard impact test for cast iron, figures published by different investigators are difficult to compare. In the laboratory of the Climax Molybdenum Company a figure of 23.6 ft.-lb. per sq. in. was obtained from a commercial cylinder iron without nickel, chromium and molybdenum, while another commercial cylinder iron containing 1.00 per cent nickel, 0.30 per cent chromium and 0.65 per cent molybdenum gave 32.1 ft.-lb. per sq. in.

The compressive strength of cast iron is greatly increased by the addition of molybdenum, according to the results of different European investigators. This high compressive strength, together with its other high physical properties, makes molybdenum cast iron specially suited for certain internal combustion engine parts and for dies. Piwowsky obtained a compressive strength of 87,500 lb. per sq. in. in a low-silicon iron with 0.41 per cent molybdenum, as compared with 82,600 lb. per sq. in. for a similar iron without molybdenum, while with

a high-silicon iron he obtained a compressive strength of 125,800 lb. per sq. in. with a molybdenum content of 0.52 per cent.

Foundrymen are said to remark generally upon the increase in the fluidity of iron with the addition of molybdenum. Owing to the somewhat denser or more close-grained nature of the molybdenum iron, it is advisable to use slightly larger gates and risers to feed the casting. Shrinkage of castings is reduced when molybdenum is added to the iron, and Sherwin and Kiley found the necessary shrinkage allowances for various irons to be as follows (in in. per 18 in.): A plain cast iron, 0.135; an iron with 0.19 per cent molybdenum, 0.130; with 0.38 per cent molybdenum, 0.090; with 0.73 per cent molybdenum, 0.105; with 0.82 per cent molybdenum, 0.105. Owing to the low shrinkage of molybdenum cast irons, the danger of cracking at changes in section while the casting is cooling down is said to be reduced.

Molybdenum additions are said to improve the machining qualities of cast iron and to make possible a much better finish.

A considerable number of uses have

been found for molybdenum iron in the automotive industry. They are being used for the cylinder blocks for many truck engines as well as for those of some passenger-car engines. The analyses of the irons used for this purpose generally range as follows:

Total Carbon	Si.	Cr.
2.90-3.40	1.80-2.30	0.15-0.40
Ni.	Mo.	
0.15-0.50	0.35-1.50	

On one make of passenger car a molybdenum-iron brake drum is used, the iron in this drum having the following composition: Total carbon, 2.50-2.75; silicon, 2.20-2.40; molybdenum, 0.60; manganese, 0.60; phosphorus, 0.20 max.; sulfur, 0.10 max.

One manufacturer uses nickel-chromium-molybdenum iron for camshafts, where it offers the advantage that the shaft can be completely finished by grinding and saves many operations. Crankshafts of molybdenum cast iron are said to be undergoing tests with encouraging results. Other automotive parts in which molybdenum iron is being used include pistons, valve-stem guides, valve seats, clutch plates, small gears, cylinder liners, manifolds and tappets.

Waning Daylight Turns on Lights Automatically

A DEVICE that operates to turn electric lights on or off when daylight decreases or increases in intensity to a predetermined value has been developed by the Westinghouse Electric & Manufacturing Company.

Applications for this unit, called the Photolux, vary from insuring adequate office and factory lighting to lending a maximum of advertising value to illuminated signs and show windows.

Indoor models of Photolux are housed in panel board cabinets for either flush or projection mounting, equipped with locks. Knockouts are provided on all sides of the case and there is ample room for wiring inside the cabinet.

Mounted in the cabinet is a vacuum phototube, a one-tube amplifier, and the necessary auxiliary apparatus, including a transformer,

primary relay, and auxiliary contactors, resistors, potentiometers,



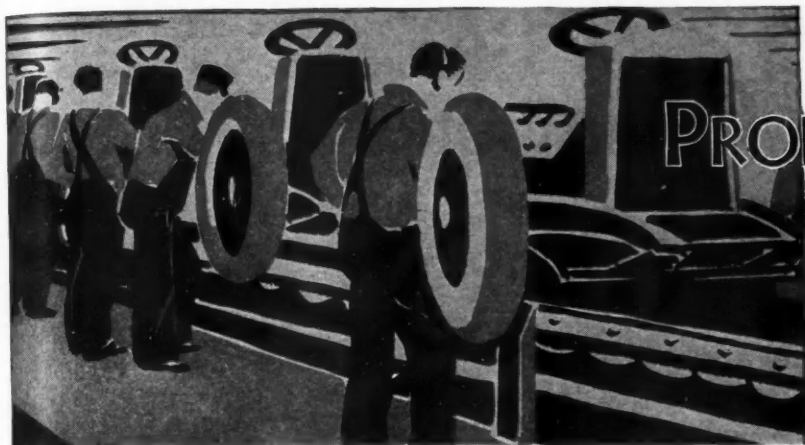
Photolux automatic lighting controller

and condensers. This apparatus is all mounted on the front side of the

1/8-in. steel panel. The tube sockets and adjustment panel are all combined in a small unit. The adjustment panel contains all the necessary adjustments such as dials, time clock dial, switches, etc.

The outdoor models of the Photolux are mounted in a cast-aluminum cabinet sealed by gaskets. Convenient conduit openings sealed by pipe plugs are provided at the top and bottom of the cabinet. A padlock may be easily applied.

This model is for very sensitive operation and is equipped with copper oxide dry rectifiers which provide power for a very sensitive amplifier circuit. The rectifiers are mounted on the back of the main panel, while the other apparatus such as relays, tubes, transformers, etc., are mounted on the front in the same location as in the indoor units.



PRODUCTION LINES

An Improvement

According to the International Nickel Company of Canada, Ni-Hard, a cast iron containing $4\frac{1}{2}$ per cent of nickel, is now being tried out for valve-seat inserts of internal combustion engines. Ni-Resist, an alloy cast iron containing approximately 14 per cent of nickel, 6 per cent of copper and 2 per cent of chromium, is being successfully used for engine pumps, manifolds, valve seats, heat-control valves. It is both corrosion-resistant and heat-resistant. The production of this alloy increased $2\frac{1}{2}$ times over that of 1931.

Borizing Iron

Exceptional performance is shown by a Heald Bore-matic in finishing cast iron gasoline meter bodies. Four holes, $3\frac{5}{8}$ in. diameter x 2 in. long, are bored in accurate alignment. They are bored from the rough with a single tool removing $5/16$ in. stock; no other finish is required. Tolerance on the diameter is 0.001. Production, 28 holes per hour. Tool life, 150 holes between grinds. No other comment is needed either on the machine or the tungsten carbide tooling.

Momentum

Influx of social and labor legislation is predicted by Dr. C. C. Balderston of the University of Pennsylvania. His impression is based upon a coast-to-coast survey of industrial executives. In presenting this report at the 1933 meeting of the Wharton Institute, Dr. Balderston expressed the opinion that industrial leaders probably will give such legislation their support.

Bookshelf Stuff

Add to your bookshelf of management literature—"Index of Economic Reports, 1933" which is being distributed, free, by the Policyholders Service Bureau. It will provide at your finger tips a cross-indexed list of studies in the field of management. Studies of how many people handle budgets, personnel matters, cost accounting, etc. These interesting surveys are supplied free of charge to any one interested.

Indispensable

Technically trained men are necessary in the rubber industry, said George Oenslager, research chemist of The B. F. Goodrich Co., in accepting the 1933 Perkin medal. When the chemist came in, empirical methods went out. And technical men developed the scientific control of raw materials and processes that contributed so much to the growth of the tire and rubber industry. Thus the Perkin medallist lauds one phase of research. His observations apply with equal strength to the need for research and technical men in the automotive industry. Progress would halt without research, and the men capable of carrying it on.

Full Protection

Forty-four parts of the 1933 Oldsmobile are either Bonderized or Parkerized, according to the current issue of *The Parkerizer*. Among these are such units as: fenders, running board splashers, radiator shells, radiator grilles, tire covers. The 44 parts have an estimated area of 220 sq. ft. per car. The factory set-up for Bon-

derizing consists of an automatic, conveyorized system which carries the parts through the cleaning and rinse tanks, through a 1200 gal. tank of solution, and the drying ovens.

Real Progress

The majority of producers of coated abrasive products who have accepted simplified practice recommendation R89-32 have expressed their intention to identify the simplified lines by including statements in trade literature, according to an announcement by the Bureau of Standards. Labels identifying the simplified coated abrasive products are being attached to packages. This recommendation, proposed and developed by the industry, is concerned with the size, backing, coating and grade numbers.

Saves Packing

Life of leather packing in hydraulic equipment is said to be greatly prolonged by chromium plating the surfaces on which the packing slides. According to *The Houghton Line*, this is particularly advantageous where the liquids tend to corrode or etch the surface.

24 Out of 100

Out of every dollar's worth of finished products manufactured in the United States, labor is computed to get about 24 cents. That average has been determined by Dr. Tracy E. Thompson, industrial analyst of the Census Bureau, after intensive fact-finding in the last census. It is based on 1929 manufactures, but Dr. Thompson considers it applicable to other years. The variation of labor's share from one type of manufacture to another appears to be in inverse ratio to the percentage of the finished product's value which has gone to raw materials. J. G.



Our Industry's Contribution to a Century of Progress

(Continued from page 608)

In the center under the dome a pillar, extending 30 ft. above the floor, will support a giant reproduction of the Standard Oil crown, large enough to contain four motion picture projection booths. A balcony at the west side of the dome, reached by escalators, will permit close-up views of the pictures projected from the booths.

Two Packard cars have been specially designed for exhibition under the dome with a view to presenting a striking contrast between the transportation vehicles of today and the crudity of the olden types of conveyances which will be shown.

The Cord Corporation will have, in the great hall adjoining the dome, a complete exhibit of automobile and air transportation vehicles. The exhibit includes Auburn, Duesenbergs and Cord cars. A Stinson cabin airplane will be shown on the floor and Lycoming motors will be on display.

The Studebaker Corporation will exhibit present day and early models in a comprehensive display of its products.

United Air lines has arranged an impressive aviation exhibit, which includes one of the world's fastest multi-engined, all-metal planes. The ship, a Boeing low-wing monoplane, has a wing spread of 75 ft. and is powered by two 850-hp. supercharged Wasp engines. Among others of the latest developments it has thermostatically controlled vapor heating. Cat walks will enable visitors to inspect the ship with ease and convenience.

Many of the other air lines, including those of the Cord interests, will be represented. An illuminated map prepared by the air mail and passenger line operators of the nation will show the various air transportation routes.

One of the most novel displays in the Transport building will be that of the Borg-Warner Corp.,

Among the interesting exhibits at the Westinghouse display in the Great Hall of Electricity are models showing this company's work in the development of streamlined rail-cars



which will be featured by an illuminated glass panel automobile. The outline of a very modern car, actual size, has been etched on a series of glass panels. Within the car are shown the actual radiator, timing chain, carburetor, clutch, free-wheeling unit, universals, starter ring gear, transmissions, wheels, and automatic oil control, all made by Borg-Warner.

A separate structure also is the Firestone Tire and Rubber Company's building, perhaps one of the outstanding examples of modern architecture to be seen at the fair. The main building is a hall 50 ft. wide and 150 feet deep. In it there will be a large exhibition room in which tires will be manufactured at the rate of one in seven minutes. Besides the main structure, which is at considerable distance from the Travel and Transport building, are two groups of shops with show windows both facing a circular plaza and displaying products of the rubber industry.

Other buildings on the fair grounds will house automotive exhibits to a greater or lesser extent. In Science Hall, the Agricultural building, the Electrical building and others will be seen exhibits of automotive parts, accessories, materials and production equipment. The companies exhibiting such products will be found in the accompanying list of exhibitors from

the automotive and allied industries.

In a triple-staged, outdoor theater, 170 ft. long and 175 ft. deep, on the lake front, "Wings of a Century," a pageant of the progress of transportation, will be presented daily. The cast and "props" for the pageant includes 200 actors, 70 horses, seven trail wagons, 10 trains, ships, steamboats, automobiles and a model of the Wright Brothers' first airplane.

Fair visitors will be transported about the grounds in Greyhound trailer type buses, express and local service being offered throughout the 13-mile expanse of the fairgrounds.

Worm-Gear Drives

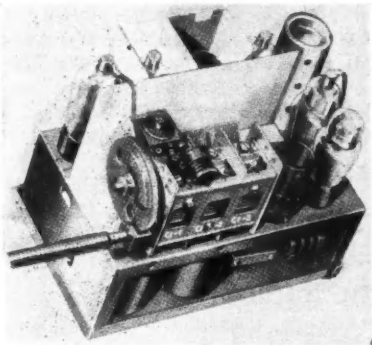
In the article "Parts Makers' Role Gets Bigger as Automobile History Unfolds," in *Automotive Industries* of May 6, no mention was made of the important contributions to automobile development made by manufacturers of worm gearing and worm-gear-driven axles. Worm gearing has been of great help in the efforts to make the mechanism of motor vehicles more nearly silent in operation, and the undermounted worm drive has made it possible to place the center of gravity lower and thus add to the stability and safety of cars.

Six-Tube Super for Automobiles

A new automobile radio set, the Sparton 33, has been placed on the market by the Sparks-Withington Co. of Jackson, Mich. It is a six-tube superheterodyne, the chassis of which is an entirely self-contained all-electric unit. All battery current is obtained from the automobile storage battery and no external elimination or connecting wire is necessary.

The control unit, which is calibrated in kilocycles, is mounted on the steering column, thus making it unnecessary to mar the instrument panel. The volume control is operated through duplex diode triode type tubes, and is claimed to keep the volume close to the level desired by the listener. A loud speaker of the electro-dynamic type is supplied. It is mounted with a single stud so it can be readily detached, and with the aid of a long cord, which is not regular equipment, however, can be used at the beach, camp or picnic grounds outside the car.

The steel chassis may be mounted in the driver's compartment underneath the instrument panel or else in the engine compartment. Its dimensions are 9% by 7% by 5% in.



Radio unit of Sparton All-Electric 33 automobile radio

Ferrous parts are rust-proofed by cadmium plating. Component parts are dual shielded to minimize interference and permit of a high degree of sensitivity. The unit is mounted with three bolts. To prevent detuning by road shock, the rotor of the tuning condenser is provided with a counter weight. The "B" supply unit is built into the chassis, but is in its own container, so that it can be easily detached or serviced.

An antenna-compensating condenser is provided by which the receiver can be adjusted so as to operate at maximum efficiency for the particular antenna to which it is connected. The drain on the battery is said to be less than one-half that of the lamp equipment of the car.

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Radiator Tubes Rolled at 270 f.p.m.

Kane & Roach, Inc., Syracuse, N. Y. announces a high speed machine, the No. 000X cold roll forming machine capable of a speed of 300 ft. per min. This machine is suitable for rolling an unlimited variety of shapes and sections and is built in several sizes.

The illustration shows a set up for producing radiator tubes of Lake copper, tin coated, at a rate of 270 ft. per min.

Drive from the motor is by V-belts to line shaft, to which is coupled a series of worm reduction units, each driving a proportionate number of roll stands. Worm drives, couplings and spur gears operate in an oil bath in oil tight cases. The few remaining bearings are high pressure Alemite lubricated. The motor is mounted on the rear side of the cabinet base on a hinged sub-base where it is accessible for oiling and inspection and where ventilation is assured.

The hinged sub-base is said to permit easy motor adjustment for taking up the slack in the V-belts, which are fully enclosed and protected. The ma-



Kane and Roach roll forming machine

chine is anti-friction bearing equipped. It is mounted on a substantial cabinet type base with a trough cast around the top, which serves as a return reservoir for coolant and catches any overflow of lubricant from bearings, preventing any oil seepage on side of machine.

The company has also built a machine of this type for taking the stock from the coil, cutting and feeding into the forming machine in cut lengths at the same high production.

Builds New Line of AC Generators

A new line of AC generators for portable lighting sets has been announced by the Marble-Card Electric Company, Gladstone, Michigan, ranging from 0.6 KVA to 75 KVA capacity. The generators are of the separately excited type and have the direct current exciter bolted directly to the main generator frame as shown.

According to the company nearly all demand for this type equipment

calls for ball bearings. Two ball bearings are used to support the exciter shaft and two for the main generator shaft, the two shafts being coupled together by flexible coupling.

Three phase, three wire and four wire machines, as well as single phase, two and three wire types, are built in all standard sizes up to 75 KVA, 3 phase, and up to 50 KVA, single phase, and in addition to these standard machines many special sizes with highly special characteristics are built for manufacturers of engine driven generator sets.

Marble-Card AC generator for portable lighting sets



Ford Balance Sheet Indicates 1932 Loss of \$44,222,567 Equal to About \$98 per Car

Net Working Capital Drops \$53,188,791 and Total Assets \$57,401,407 — Current Ratio Continues High at More Than 10 to 1

PHILADELPHIA—A net loss of \$44,222,567 for the year ended Dec. 31, 1932, is indicated by the condensed balance sheet filed by the Ford Motor Co. with the State of New Hampshire. The statement shows a surplus of \$611,079,680 as compared with \$655,302,247 on the 1931 balance sheet as reported by *Moody's*, the difference between these sums representing the decline in net worth last year. Based on an estimated output of 450,000 vehicles, the indicated loss per car approximated \$98.

Net working capital at the end of 1932 was \$334,416,037, the balance

sheet indicates, as compared with \$387,604,828 a year earlier, a decline of \$53,188,791. Total assets dropped \$57,401,407 during the year to \$664,928,308.

A comparison of production and indicated earnings back to 1926, the last full year of Model T production follows:

	Approximate Production	Indicated Earnings
1932	450,000	—\$44,222,567
1931	750,000	— 53,586,000
1930	1,500,000	+ 44,460,823
1929	1,951,092	+ 81,797,861
1928	854,818	— 72,221,498
1927	454,601	— 42,786,727
1926	1,810,029	+ 75,270,895
		—\$11,287,213

Following are the 1932 and 1931 balance sheets:

	1931	Assets 1932	Change
Inventories	\$ 64,884,691	\$ 67,814,080	+\$ 2,929,389
Cash, Receivables, Invest.	372,483,105	303,186,085	— 69,297,020
Total Current Assets	\$437,367,796	\$371,000,165	—\$66,367,631
Machinery and Equipment	124,601,735	126,243,611	+ 1,641,876
Real Estate	158,387,688	161,774,842	+ 3,387,154
Other Assets	1,972,496	5,909,690	+ 3,937,194
Total Assets	\$722,329,715	\$664,928,308	—\$57,401,407
Liabilities			
Accounts Payable	\$ 38,824,298	\$ 30,223,430	—\$ 8,600,868
Other Liabilities	10,938,670	6,360,698	— 4,577,972
Total Current Liabilities	\$ 49,762,968	\$ 36,584,128	—\$13,178,840
Capital Stock	17,264,500	17,264,500	None
Surplus	655,302,247	611,079,680	— 44,222,567
Total Liabilities	\$722,329,715	\$664,928,308	—\$57,401,407

NEW

N.A.C.C. Sets Jan. 6 as N. Y. Show Opening Date

The National Automobile Chamber of Commerce will open the 1934 National Automobile Show in Grand Central Palace, New York, on Saturday, January 6. The Show Committee of which Charles D. Hastings is chairman, announced that a decision on plans and date of the Chicago show will be made by the annual meeting of the manufacturers in New York next month.

The committee will encourage the attractive action exhibits of testing and precision machinery.

Dodge Adds New Body

DETROIT—A new station wagon body-type to be known as the Westchester Semi-Suburban has been added to its six cylinder line by the Dodge Bros. Corp.



Ten Years at the Helm

Alfred P. Sloan, Jr., celebrates this month his tenth anniversary as president of the General Motors Corp. During his tenure of office the corporation has sold 11,542,000 cars and trucks; its net sales have approximated \$9,600,000,000; its earnings have totaled \$1,396,000,000 and it has paid out in dividends \$1,073,000,000. Capital and surplus less intangibles have grown from \$415,000,000 at the end of 1923 to \$809,000,000 at the end of last year. During the ten-year period, the corporation's share of the industry's unit volume has increased from about 21 per cent to in the neighborhood of 40 per cent.

In addition to being the largest factor in the auto-

motive industry, during Mr. Sloan's administration the corporation has gained recognition as one of the outstanding industrial organizations of the world. Its record of earnings and financial strength during the years of depression has been equalled by but few, if any, of the leading companies in other industries. Throughout this period Mr. Sloan has been a most energetic and willing worker in the general activities of the industry through the N.A.C.C. His recent efforts in Washington in connection with pending legislation and the leadership he exercised in the Detroit bank crisis, have served further to solidify his position as one of our real industrial leaders.

WS

May U. S. Retail Car Sales Expected to Total 170,000, a 30% Gain over 1932

Total Car and Truck Production of 201,000 Indicated for the Month—Industry Looks for Prolongation of Usual Selling Season

By ATHEL F. DENHAM
Field Editor, Automotive Industries

DETROIT—May retail sales of passenger cars in the United States should approximate 170,000, an increase of roughly 30 per cent over May, 1932, and of 13.5 per cent over April, 1933. This estimate is made on the basis of sales reports for the first two weeks of May, and on the assumption that sales for the closing weeks will represent a normal percentage of the total month's business.

The first sales reports available show that while the opening week or ten days of May produced the usual decline from the peak reached during the closing week or ten days of the previous month, the comparative showing with last year has improved materially, with gains ranging from 22 to 35 per cent. This development lends further assurance to the belief that this year's selling season will be extended relatively farther than has been customary in the past few years.

Particular bright spots include Plymouth with 4700 cars sold during the week ending May 6 alone, the largest volume of retail deliveries in one week in the history of the company, it is claimed. It is too early yet

to tell the effect of the introduction of the 113 in. wheelbase Essex Terra-plane Special Six on total sales by Hudson, but dealers' orders received since the radio announcement of this car have been sufficient to raise production schedules beyond any month of 1932 or 1933.

Ford production apparently has been dropped slightly during the opening weeks of May, with schedules at the present time running around 2300 to 2400 daily as compared with a peak of some 2500 daily reached a few weeks ago. It is entirely possible though not probable however that schedules may be revised upwards later in the month. Unless further increases by producers are made, it is not expected that total production for the industry will exceed materially the 201,000 estimate made in these columns two weeks ago.

Hupmobile reports retail sales for the first two weeks 23 per cent ahead of the same period for April with new car stocks in the hands of dealers, as of May 12, approximately 52 per cent under that of last year at this time.

Akron Employment Up 3,000 Since April 1

All Factories Operating on Full-Time Schedules

AKRON—More than 3000 rubber workers have been recalled to their old jobs in the tire factories here since April 1, and all the factories in the district are now operating on full time schedules for the first time since 1929.

Goodyear and General have adopted a seven day week, both operated last Sunday for the first time since the depression began.

Harvey S. Firestone announced early this week his factory is now on a full time basis of production in the tire plant and also in the battery, spark plug, brake lining and accessory plants, and in its mechanical rubber goods division and the Firestone rim and steel products factory. Mr. Firestone reports orders are now running 50 per cent ahead of May 1932.

Goodrich, with a 200 per cent increase in production since April 1, began working on a full time basis this week, with a 24-hour day, six day week, for the first time since October, 1929, President James D. Tew announced.

which includes bumpers, six wire or demountable wood wheels, fender wells and trunk rack. In addition it carries the usual standard equipment of double windshield wipers, dual trumpet horns, dual tail lamps, and two interior adjustable sun visors. The body is custom designed and built by LeBaron.

W. O. Briggs Becomes General Manager

DETROIT — Walter O. Briggs, president, has taken over the general managership of Briggs Manufacturing Co., succeeding H. E. Hund, who resigned recently. W. Griffith, treasurer of Briggs Commercial and Development Co., was elected a director at the annual meeting of the board last Wednesday, also replacing Mr. Hund. All other officers and directors were reelected.

Pennsylvania Adopts Responsibility Law

HARRISBURG, PA.—Pennsylvania now has a financial responsibility law as a result of the approval by Gov. Pinchot of the Uniform Automobile Liability Security Act passed by the Legislature. The new law provides that motorists who become involved in accidents causing death, injury or property damage of \$200 or more, or whose licenses are revoked or suspended for violation of the motor laws, must show financial responsibility as a condition precedent to continuance of the operating privilege. If responsibility is shown by an insurance policy it must provide \$5,000 minimum for one person and \$10,000 for a single accident.

Plymouth Unfilled Orders Approximate \$10,000,000

DETROIT—Plymouth Motor Corp. has announced that 77 per cent of its output for May already has been sold to dealers.

With 26,000 standard and deluxe Plymouth models scheduled for production this month, the Plymouth factory now has bonafide unfilled orders on hand for approximately \$10,000,000 worth of motor cars, according to B. E. Hutchinson, chairman of the board of Plymouth Motor Corp. At the present rate of sales, Plymouth will have sold more than \$30,000,000 worth of its recently introduced new models to dealers by May 31.

Hunsaker Gets Medal

NEW YORK—The Daniel Guggenheim Medal, recognizing "notable achievement in the advancement of aeronautics," has been awarded for 1933 to Commander Jerome Clarke Hunsaker, vice-president of the Goodyear-Zeppelin Corporation, Akron, Ohio, it is announced by Alfred D. Flinn, secretary of the Board of Award.

New Chrysler Custom Model

DETROIT—Chrysler has added a new 2-passenger stationary-top coupe with rumble seat to its Custom Imperial Line. The price is \$3,440,

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

Many branches of business last week made the best showing for the year, which is especially encouraging because in several cases the moderate increases are contrary to the usual seasonal movement. A few industries reported levels of activity above those a year ago. Both retail and wholesale trade improved, with prices higher.

Freight Loadings Drop

Railway freight loadings during the week ended May 6 totaled 523,819 cars, which marks a decrease of 11,857 cars below those during the preceding week, a decrease of 10,132 cars below those a year ago, and a decrease of 221,921 cars below those two years ago.

Retail Sales Improve

Department store sales during April showed a decrease from those in March by less than the estimated seasonal amount. The adjusted index of the Federal Reserve Board for April stood at 68, as against 55 for March and 60 for February.

Employment Better

The level of New York State factory employment during April was 2.7 per cent higher than that during the preceding month. Total payrolls were also higher, showing an increase of 4.4 per cent.

Crude Oil Production

A further gain in crude oil production during the week ended May 6 was reported. Average daily production amounted to 2,648,850 barrels, as against 2,383,100 barrels for the preceding week and 2,251,900 barrels a year ago.

Power Production Higher

Production of electricity by the electric light and power industry of the United States during the week ended May 6 was $\frac{1}{2}$ of 1 per cent above that in the corresponding period last year and reached the highest level since the week ended February 18 of this year.

Fisher's Index

Professor Fisher's index of wholesale commodity prices continues to show a gradual upturn. The index for the week ended May 13 stood at 59.5, as against 59.2 the week before and 58.6 two weeks before; the latest index is the highest since the week ended Dec. 3, 1932.

Stock Trading Heavier

After a relapse in the first part of last week, the stock market resumed its buoyancy. Among other developments that checked the earlier downward course of prices was the report indicating a substantial improvement in the steel industry. The bond market was strong during the entire week, even at the time when stocks were declining. Trading in stocks toward the end of the week was heavy, and most issues registered net gains for the period.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended May 10 showed decreases of \$2,000,000 in holdings of discounted bills and of \$31,000,000 in holdings of bills bought in the open market. Holdings of Government securities remained unchanged. The reserve ratio on May 10 was 64.6 per cent, as against 63.5 per cent a week earlier and 62.7 per cent two weeks earlier.

Studebaker Orders 17 Per Cent Above 1932

SOUTH BEND, IND.—May dealer orders received for Studebaker and Rockne passenger and commercial cars, both domestic and export, as of record May 10, totalled 3748 units against 3194 on the same date last

year, an increase of 17.3 per cent, according to Paul G. Hoffman, president of The Studebaker Sales Corp. of America. The total represents a gain of 17 per cent over orders as of record April 10, 1933. This is more than a seasonal increase as our May over April gains have averaged 12.8 per cent over the last ten-year period.

Supreme Court O.K.'s Store - Door Delivery

Refuses Injunction Barring Pennsylvania R.R. Service

WASHINGTON, D. C.—The right of the Pennsylvania Railroad to provide delivery and pick-up service by motor truck between its Jersey City railheads and shippers and consignees located in the boroughs of Manhattan, Brooklyn and Queens in New York City, was upheld by the U. S. Supreme Court when it denied a request for an injunction forbidding such service, asked by various carriers and terminal companies serving the boroughs in question.

The decision is of considerable importance as other railroads have held off on store-door service on the ground that the legality of such service was doubtful. The Pennsylvania had been upheld in the lower courts and the Supreme Court's refusal to reverse these courts, disposes of the matter finally.

Chrysler Has Best Week in 10 Months

DETROIT—Figures released by J. W. Frazer, sales manager of Chrysler Sales Corp., show that the week ending April 29 was the best in point of retail deliveries that Chrysler dealers have experienced in ten months. Deliveries of Chrysler and Plymouth cars by Chrysler dealers in this week were 21 per cent larger than in the week ending April 22.

DiVco Sales Up 250%

DETROIT—April sales to dairies and milk companies of the patented low aisle house-to-house DiVco delivery vehicles were 250 per cent in excess of sales in March, it was announced by W. R. Angell, president of Continental-DiVco Co., a subsidiary of Continental Motors Corp. The Continental-DiVco head states that unfilled orders on hand, together with promising future sales, point to a continuation of the satisfactory business just reported for April.

Dodge Sales Gain 30%

DETROIT—During the week ended May 6, Dodge retail deliveries totaled 3551 new units. Of this total, 1800 units were passenger models; 1440 were Plymouth and 311 were Dodge trucks. This represents an increase of 29.9 per cent over the same period of last year.

Machine Tool Orders Gain

CLEVELAND—An advance to 16.2 in April from 13.4 in March in the index of machine tool orders, is reported by the National Machine Tool Builders' Association.



Train of thirty box cars, loaded with Dodge and Plymouth automobiles, consigned to Walsh Motors, Inc., Kansas City, Missouri, being piloted out of the factory yards by no less a person than K. T. Keller, President of Dodge Brothers Corporation. President Keller, like Walter P. Chrysler, is not a stranger to a railroad locomotive, both gentlemen having in earlier days been engaged in railroad engineering.

Hudson Exports Make Big Gain Over 1932

DETROIT—Hudson-Essex exports for the first four months of 1933 were 72 per cent better than for 1932. Orders now on hand for May shipment are almost three times as great as for the entire month of May last year, although as this is written the first week of May is not as yet complete.

Herman F. Koestlin

DETROIT—Herman F. Koestlin, president of the Koestlin Tool and Die Corp., died of acute indigestion on May 10 in Kodiak, Alaska, where he had gone to hunt big game. He was 49 years of age and came to Detroit nearly 20 years ago as superintendent of the Edmunds-Jones Manufacturing Co. In 1916 he founded and became president of the Koestlin Tool and Die Corp.

Hupp Sales Expand

DETROIT—Rufus S. Cole, vice-president in charge of sales, Hupp Motor Car Corp., has reported that shipments for the first eight days of May compared with the first eight days of April showed an increase of 29 per cent.

Retail deliveries for the week ended May 6 were greater than for any single week since June 24, 1932, and show an increase of 31 per cent over the week ended April 28. Retail deliveries for the four weeks ended May

6, compared with the previous four-week period, show an increase of 51 per cent.

Clark Quarterly Report

BUCHANAN, MICH. — Clark Equipment Co. reports net loss of \$136,569 for the quarter ended March 31, 1933, against a net loss of \$134,166 in the corresponding quarter in 1932.

Auburn May Shipments

AUBURN, IND.—Shipments of the Auburn Automobile Co. for the first ten days of May, 1933, equaled shipments for the entire month of May, 1932, when 348 were forwarded.

Radio Connects Race Car with Pits

INDIANAPOLIS — Radio waves will replace the blackboard as the means of communication between Alden Sampson's 16-cylinder racer and the pits at the coming 500-mile race. Two-way communication will be maintained between Sampson in the pits and Herschell McKee, riding mechanic for Chester Gardner who will drive car. Complete short-wave radio receiving and transmitting equipment has been installed in the car and in the pits for the purpose.

Ford Sells U.C.C. to C.I.T. for 30 Million

U.C.C. to Be Maintained as Separate Organization

NEW YORK—Contracts have been signed for the sale by the Ford Motor Co. of its interest in the Universal Credit Corp. to Commercial Investment Trust Corp., according to a joint announcement made today by Henry Ford and Henry Irtleson, President of C.I.T. For its interest, the Ford Motor Co. will receive approximately \$30,000,000. No new financing by C.I.T. will be required.

"The reason we are selling the finance company," Mr. Ford said, "is very simple. We are essentially manufacturers, and the finance company is essentially a banking business. We wanted to separate the two."

In the transfer of ownership from the Ford interests to C.I.T., the Universal Credit Corp. will retain its identity and will be operated under its present management as a separate unit of C.I.T. Ernest Kanzler, president of Universal Credit Corporation, and G. H. Zimmerman, vice-president, will continue in the same positions as heretofore.

As a result of the absorption of U.C.C., Ford is added to the already imposing list of companies with which C.I.T. has financing contracts. The list now consists of Ford, Hudson, Essex, Graham-Paige, Hupmobile, Nash, Pierce-Arrow, Reo, Rockne, Studebaker, Federal and White.

In its five-year history, U.C.C. did more than a billion dollars worth of business.

Hayes Loss Lower

DETROIT—A net loss of \$98,195 is reported by the Hayes Body Corp. for the quarter ended March 31, 1933, against the net loss of \$100,597 in the first quarter of 1932.

Hercules Cuts Loss

CANTON, OHIO—Hercules Motors Corp. sustained a net loss of \$43,975 in the first three months of 1933 as compared with a loss of \$48,567 in the corresponding period in 1932.

Briggs Quarterly Statement

DETROIT—Briggs Mfg. Co. reports net loss of \$895,963 after charges of the quarter ended March 31, against a loss of \$953,933 in the 1932 quarter.

Bosch Loss Cut Sharply

SPRINGFIELD, MASS.—United American Bosch Corp. reports net loss after charges of \$76,504 for the first three months of 1933 as compared with \$306,259 in the corresponding period of 1932.

Retail Financing Drops 33% in Volume and 28% in Units in the First Quarter

WASHINGTON, D. C.—Statistics of automobile financing based on data reported to the Bureau of Census by 290 identical finance companies, follow:

Year and Month	Wholesale Financing Volume in Dollars	Number of cars	Total Volume and Average		Number of cars	New Cars Volume and Average		Retail Financing Used Cars Volume and Average		Number of cars	Unclassified Volume and Average		
			Total Amount	Per car		Total Amount	Per car	Total Amount	Per car		Total Amount	Per car	
1932													
January	\$ 34,841,766	122,344	\$ 44,628,529	\$365	41,375	\$23,475,671	\$567	77,321	\$19,974,286	\$258	3,648	\$1,178,572	\$323
February	33,276,393	123,574	44,829,138	363	40,780	23,623,496	579	78,802	19,941,665	253	3,992	1,263,977	317
March	34,121,364	140,779	51,148,285	363	46,234	26,887,515	582	90,121	22,779,892	253	4,424	1,480,878	335
Three Months	102,239,523	386,697	140,605,952	—	128,389	73,986,682	576	246,244	62,695,843	255	12,064	3,923,427	—
1933													
January	\$ 30,133,331	91,673	\$ 31,203,703	\$340	35,475	\$18,299,175	\$516	53,887	\$12,124,628	\$225	2,311	\$ 779,900	\$337
February	27,502,928	86,881	29,118,537	335	32,535	16,826,821	517	52,228	11,669,547	223	2,118	622,169	294
March	27,641,561	101,016	33,436,244	331	38,184	19,376,973	507	60,322	13,310,549	221	2,510	748,722	298
Three Months	85,277,820	279,570	93,758,484	—	106,194	54,502,969	512	166,437	37,104,724	223	6,939	2,150,791	—
Per Cent Loss	—17	—28	—33	—	—17	—30	—11	—32	—41	—13			

Willys Workmen Get Balance of Pay Due

Payment Clears Way for Reorganization Move

TOLEDO—Payment of the remaining \$90,000 to workmen of the Willys-Overland Co., on May 20, was ordered by Judge George P. Hahn in Federal Court here Monday.

Attorneys for the workingmen were allowed \$6,000 as their fee for efforts to bring about the payment.

Last week a similar distribution brought the total paid to 70 per cent.

Payment of the labor claim accrued at the time of the receivership does much to clear the way for reorganization. Tax claims, bonded debt and general creditors' claims now remain to be worked out in the reorganization plan to be ready for which preferred stockholders are now organized.

Quite rapid movement of the cars now held in stock is reported from the plant here.

Work on the Model D-5 trucks for International Harvester Co., is also proceeding on schedule.

John N. Willys, receiver, here for a conference with Judge Hahn a few days ago, said he was pleased at the rapidity with which the problem of paying the workers had been solved and that steady progress is being made in working out the affairs of the company. L. A. Miller, co-receiver, has been in California on company business for more than a week.

Cleveland Welding Reports

CLEVELAND—Cleveland Welding Co., a subsidiary of Motor Wheel Corp., reports net loss for 1932 of \$68,913 compared with a loss of \$96,732 in 1931.

Bus Facts Issued

WASHINGTON, D. C.—The 1933 edition of *Bus Facts* was issued this week by the National Association of Motor Bus Operators.

A Counter-Attack by Motor Transport

TULSA—For several years many railroad officials—and no one else, so far as I am advised—have been actively engaged in an effort to secure legislation, the effect of which would be to restrict and/or increase the cost of highway transportation.

The needs or desires of the shipper, the consumer, and the motor vehicle taxpayer have been disregarded by these propagandists.

Highway transportation has been painted as a parasite sucking the life blood of the older system.

The amount of misinformation they have circulated—some of which has been accepted as fact—would fill another congressional library.

During the recent sessions of the state legislatures thousands of bills were introduced which, if passed and enforced, would have increased the cost of, and crippled or destroyed, highway transportation.

Many of the unfair bills which the railroads caused to be introduced in the legislatures last year were defeated, but that does not mean that the fight is over. Far from it—I am confident that the railroad anti-highway campaign will continue. And I am convinced it can be defeated, if the friends of highway transportation present a united defense and join in an aggressive counter-attack.—A. J. Brosseau, President, *Mac k Trucks, Inc.*, before the *Mid-Year Meeting of the American Petroleum Institute*.

Payrolls Gain Despite Drop in Employment

DETROIT—Automobile employment in Michigan during April totaled 122,182 compared with 131,281 in March and 159,934 in April 1932, based on reports of 68 companies and compiled by the State Department of Labor and Industry.

The aggregate weekly payroll in spite of a falling off in total number of employees, was \$2,585,796 in April against \$2,230,343 in March. The April 1932 figure was \$4,130,053.

Average weekly earnings per capita were \$21.16 in April, \$17.00 in March and \$25.82 in April last year.

Diamond T Sales Rise

CHICAGO—Sales of Diamond T Trucks for the first thirteen days of May this year are in excess of those for the entire month of May, 1932, E. J. Bush, sales manager of the Diamond T Motor Car Company announces. His report includes domestic and export sales.

Swayne Appointed

NEW YORK—Alfred H. Swayne, vice-president of General Motors Corporation, has been appointed to serve on the Business Advisory Council of the American Arbitration Association.

Big April Gain for Nash

KENOSHA, WIS.—April shipments of Nash Motors were 45 per cent ahead of March and in the first week of May retailed deliveries were 28 per cent larger than in the corresponding week in April.

Weidenhoff Takes Moto-Vita

CHICAGO—Joseph Weidenhoff, Inc., has taken over the exclusive distribution to the automotive trade of the Moto-Vita Combustion Indicator, made by the Moto-Meter Gauge and Equipment Co., Toledo, Ohio.

Continental Balance Sheet as of Mar. 31

DETROIT—The March 31, 1933, balance sheet of the Continental Motors Corp. shows net working capital of \$1,624,802 as compared with \$3,000,932 on October 31, 1932. Current assets totaled \$2,747,765 at the end of March and included \$246,853 cash, \$286,086 securities, \$526,690 receivables and \$1,688,136 inventories. Current liabilities amounted to \$1,122,963 and included \$499,675 notes and accounts payable, \$293,744 trade acceptances, and \$329,544 accruals.

Doehler Acquires Toledo Residence

TOLEDO—Herman H. Doehler, president of the Doehler Die Casting Co., has purchased a home here in Westmoreland section and will come here to live June 1.

Most of the Doehler plant units have been concentrated at the Toledo plant and he has indicated that headquarters for the company will be here.

Oldfield Heads Chrysler Drivers at Chicago Fair

DETROIT—Barney Oldfield has been appointed track manager for the quarter-mile motordrome forming a

portion of Chrysler Motors' exhibit at "A Century of Progress" International Exhibition in Chicago. The public will be invited to ride with Barney and his staff of drivers which will include several of the best known racing pilots as well as members of the Chrysler engineering organization.

Olds Expands Output

DETROIT—With Oldsmobile sales continuing in May the upward trend which caused April deliveries to exceed production by 17 per cent, two successive increases this month have brought the May factory schedule to a new total 39.4 per cent above April output, it is announced by Sales Manager R. M. W. Shaw.

"After operating four days a week during April," said Mr. Shaw, "the Oldsmobile factory went into May on a five-day basis. Each 10-day period in April revealed a substantial sales increase, which brought total deliveries for the month to the highest point in nearly two years.

Fred J. Hanson

MILWAUKEE—Fred J. Hanson, experimental engineer in charge of the research laboratory of the Wisconsin Motor Co., Milwaukee, died May 12, aged 54. He was born in Milwaukee and had been identified with the Motor company 25 years.

Motors Main Factor in Steel Expansion

Higher Price Levels Indicated for Third Quarter Commitments

NEW YORK—Curves recording the pick-up in steel production and steel sales do not differ more than a hair's breadth from those depicting corresponding recovery in automobile output and sales. Steel market analysts of late have come to set up two main categories of demand, the first being that for sheets, strip, cold-finished bars, etc., entering unmistakably into the manufacture of motor cars and trucks and the second being conveniently labeled: *miscellaneous*.

With structural steel demand still lagging and that from railroads so far negligible, these miscellaneous outlets embrace in the main the general run of industrial steel absorption, much of which is of an automotive character. Garages and service stations take a good portion of what relatively little structural steel is moving so far, just as the mild pick-up in tool steel demand can be traced directly to the reawakening of interest among motor car manufacturers in machine tool offerings. Moreover, outstanding purveyors to automotive consumers among the steel rolling mills have announced plant extensions calling for heavy tonnages of steel. It is little wonder, therefore, that automobile production and sales statistics are indices of paramount importance to the steel industry at this time.

The tendency of prices in the steel market is to adjust themselves on somewhat higher levels continues, but in a very orderly way. There are now reports of a \$2 per ton advance being in the offing for third-quarter prices of semi-finished steel: billets, slabs, and sheet bars which would be nothing more than the logical sequel of the betterment in finished steel prices. Newspaper headlines, such as "Panic Among Steel Buyers" and "Big Steel Demand Slows Deliveries," heartening as they may be to Wall Street, convey an utterly distorted picture of the steel market.

Pig Iron—Advances of 50 cents @ \$1 per ton were preceded by considerable buying for current quarter requirements. Producers are none too eager to book third quarter business at the levels now in vogue.

Aluminum—Middle West remelters of secondary aluminum have advanced prices $\frac{1}{2}$ @ 1 cent per pound. Stocks of low-priced scrap have shrunk considerably and dealers are asking higher prices. The market for virgin metal is firm and unchanged.

Copper—Following the placing of a moderate volume of orders at 7 cents, delivered Connecticut, for third quarter shipment, consumers awaited further developments. Producers predicted further advances. Wire prices have been revised upwards in line with ingot quotations.

Tin—The market opened this week with prompt Straits nominally quoted at 35.65 cents. There are rumors that the International Tin Pool will start liquidating its holdings in July when production quotas undergo a change.

Lead—Quiet and steady.

Zinc—Slightly higher ore prices failed to result in any advance in the metal.

What Is Ford Going to Do?

Speculation as to prospective Ford activities is again providing a major topic of conversation in automotive industrial circles. That the Ford Motor Co. is attempting to liquidate a considerable portion of its holdings seems almost certain. Failure to confirm reports that Universal Credit was to be sold, was followed in short order by consummation of the sale. Unofficial denials also have been made of a contemplated sale of the Rouge Steel mill to one of the larger steel companies, Bethlehem being particularly mentioned. Yet officials of steel companies have been seen repeatedly at Rouge checking up on the Ford plant. It has been reported at various times that negotiations have been under way for the sale of the glass plant at Rouge to an outside company.

Next, machinery has been moved into the Highland Park plant in increasing amount of late, lending credence to the report that manufacturing activities are to be resumed there. According to one report a portion of this plant will be used to build a low cost (\$35 is mentioned as the price) electric refrigerator. It is possible, too, that it may be used for car assembly and parts production when the new, lower priced and smaller car is introduced.

Some Ford bodies are produced in a part of the Highland Park plant at the present time, and are distributed from there to the Rouge and other assembly plants. Assembly at Highland Park might therefore prove more economical in spite of the fact that water transportation is not readily available.

Concentration by Ford of assembly operations in fewer plants outside of Detroit would also facili-

tate the assembly of bodies at such points as is done by General Motors in assembly plants adjacent to Fisher body plants throughout the country.

More important to the automotive parts industry is the rather definite indication that Ford may take back from independent concerns a considerable portion of major parts production. Mentioned particularly are transmissions and bodies. Ford may set up production on some of these formerly purchased items to cover entirely a certain output volume and buy additional quantities from suppliers when and if sales exceeds his own capacity to produce. It is possible, on the other hand, that some of the parts production formerly handled at Rouge may be farmed out to parts suppliers completely. Such parts would be the more highly specialized products, it is assumed.

Another report of liquidation concerns the Lincoln Motor Co. While it has been reported that this line is to be discontinued, it is more likely that the plant and car name will be offered for sale. Ford officials refuse to either affirm or deny this report.

Whether or not the present V-8 is to be dropped when the new lower priced line is introduced is speculative, but so far no evidence of a clean-up have definitely appeared. Orders are still being released by the Ford Motor Co. to its parts suppliers on this car, although there has been some dropping off in total requirements.

The latest reports around Detroit regarding the announcement of the new car assume that it is to be a four and aimed at a larger potential market by substantial dropping of the price. In other words, it may be a modernized model T.

Airplane Engine Volume Far Ahead of Last Year

NEW YORK—Production and sales of commercial aviation engines during the first quarter of this year gained substantially over the volume for the first quarter of last year, it was announced this week by Thomas A. Morgan, president of the Aeronautical Chamber of Commerce of America. Reports to the Aeronautical Chamber by the manufacturers show that in the first three months of this year 220 engines costing \$1,024,389 were built for commercial use compared with 191 engines costing \$622,790 in the same period a year ago.

Sales and deliveries kept pace with production, Mr. Morgan pointed out. In the first three months of this year 267 engines valued at \$1,214,319 were delivered for commercial use compared with 198 costing \$619,350 a year ago.

Marmon-Herrington Gets Army Orders

INDIANAPOLIS — Marmon-Herrington officials announce the receipt of a large order for additional heavy-duty six-wheel drive motor trucks for the U. S. Army.

The new trucks will serve as carriers for ammunition and men and to haul 75 mm. field guns. Delivery will be made in four to six weeks.

Among other trucks now being completed at the Marmon-Herrington factory is an unusual six-wheel, six-wheel-drive vehicle to be used as a portable machine shop by the U. S. Army field service. When fully equipped, this truck will carry complete machine shop equipment with each machine individually powered. Even a generator is included in the equipment. This truck is built on a wheel-base of 170 inches and will have a body 13 feet long.

Tire Inventories Drop

NEW YORK—Shipments of pneumatic casings for the month of March were 8.7 per cent under February and 29.2 per cent below March, 1932, according to statistics released by The Rubber Manufacturers Association, Inc. Production of pneumatic casings was 12.9 per cent under February, and 44.5 per cent under March, 1932.

Pneumatic casings in the hands of manufacturers March 31 decreased 1.2 per cent under February 28 stocks, and 26.2 per cent under March 31, 1932.

The actual figures are as follows:

PNEUMATIC CASINGS			
	Shipments	Production	Inventory
March, 1933	2,091,878	2,037,899	7,289,976
Feb. 1933	2,292,463	2,339,373	7,376,946
March, 1932	2,954,040	3,671,090	9,877,823

May 20, 1933



An automobile built to fit this mammoth spark plug, produced for the Century of Progress Exhibition, would be nearly two blocks long.

Earl McGinnis, left, AC advertising manager, points by way of comparison to a regular spark plug held by Hector Rabezzana, AC chief engineer of the spark plug division. Others in the photograph, left to right: Auguste Pineau, experimental engineer; Harlow H. Curdice, president; C. W. McKinley, chief development engineer, and Wilson S. Isherwood, general sales manager

M.E.W.A. Catalog Out

CHICAGO—Containing more than 1000 pages, the M.E.W.A. Official Catalog has just been issued and is being distributed to members and non-members of the Motor and Equipment Wholesalers Association, it is announced by B. W. Ruark, general manager. Among the novel features is the method of indexing by sections, and since the catalog is in loose-leaf form the jobber can keep it up to date so far as the particular brand of merchandise he handles is concerned. The catalog is complete with revisions and changes in products and prices included up to April 10.

Continental Engine Sales Increase 50 Per Cent

DETROIT—Production and sales of Continental trucks, taxicabs and industrial motors in April, 1933, showed a 50 per cent increase over the preceding month, according to President W. R. Angell. Taxicab engine sales in April were 50 per cent ahead of the entire first quarter.

AC Cuts Truck Plugs

FLINT—AC "Long Life" bus and truck spark plugs have been reduced 33 1/3 per cent in price, effective May 5.

Forecast New Tie-Up for Dominion Motors

TORONTO—The prospect is held out that Dominion Motors will secure an important manufacturing tie-up with an automobile producer outside of Canada whereby a car that is comparatively new to Canada will be produced at the Leaside plant. Negotiations have not reached the stage where an announcement can be made and it is not stated whether or not the new affiliation will be with a British car manufacturer in order to take advantage of present tariffs in international trade.

The financial statement of Dominion Motors, Ltd., Toronto, for 1932 shows a net loss of \$691,741 as compared with a loss of \$242,752 in the previous year.

Current assets of Dominion Motors are \$1,295,321 while current liabilities are given as \$1,069,698, leaving a working capital of \$225,533. Cash is down from \$1,004,280 to \$111,253 while inventories have dropped to \$398,074 from \$709,073. In current liabilities, bank advances went up from \$492,700 to \$972,100 during the year.

April Car Registrations Estimated at 114,000

PHILADELPHIA—April registrations of new passenger cars in the United States amounted to 114,000 against 121,000 a year ago and 78,741 in March of this year, according to estimates based on returns from 23 states. The decline from April, 1932, amounts to approximately 6 per cent and the increase over March is about 45 per cent.

On the basis of these partial returns Chevrolet leads the field with 35,000, Ford second with 20,000 and Plymouth third with 15,000 units. As compared with April, 1932, Chevrolet shows a decline of about 23 per cent, Ford an increase of 218 per cent and Plymouth an increase of approximately 7 per cent.

New M.E.M.A. Members

NEW YORK—Eight new members have become affiliated with the Motor and Equipment Manufacturers Association within recent months according to a report submitted to the Board of Directors on the activities of the membership committee by A. H. Eichholz, general manager.

These new members are: The Brown Co., Berlin, N. H.; Huffman Manufacturing Co., Dayton, Ohio; Keasbey & Mattison Co., Ambler, Pa.; Murray Rubber Co., Trenton, N. J.; Philco Radio & Television Co., Philadelphia, Pa.; Soss Manufacturing Co., Roselle, N. J.; Superior Piston Ring Co., Detroit, Mich.; and York Corrugated Co., York, Pa.

Canada Gets Automotive Preference From France

WASHINGTON, D. C.—Automobiles, trucks and accessories and internal combustion engines from Canada are permitted to enter France at minimum tariff rates as the result of a one-year commercial convention signed for the two countries at Ottawa on May 12, according to a cablegram from Commercial Attache Lynn W. Meekins. Concessions, of course, are granted by Canada to France. The treaty covers a wide range of products.

DeSoto Holds Up-Trend

DETROIT—Combined DeSoto and Plymouth deliveries by DeSoto dealers for the week ending May 6,

showed a 4.7 per cent increase over the previous week and a 17 per cent increase over the same week a year ago, according to an announcement by L. G. Peed, general sales manager, DeSoto Motor Corp.

During the week ended May 6, 1844 cars were sold by DeSoto dealers. This was the seventh consecutive week that the DeSoto dealers have shown sales increases and last week DeSoto dealers delivered the greatest number of Plymouth motor cars in their history.

Maryland Sales Gain

BALTIMORE — Registrations of new passenger cars and trucks in Maryland during the first ten days in May total 758 against 697 in the corresponding period in 1932, a gain of 9 per cent.

1000 Salesmen to Win Free Trips to Chicago

DETROIT—More than 1000 free trips to the Chicago World's Fair will be awarded to the Chevrolet field organization by the company this summer on the basis of meritorious sales work during May and June, H. J. Klingler, vice-president and general sales manager announced Saturday.

The trips will include two days and two nights in Chicago and transportation both ways, Mr. Klingler said. Awards will go to retail salesmen making the best sales record against the quota established for them during the two months ending June 30, he explained. Each zone in the company's field set-up has been allotted a definite number of free awards, and the ranking members of the selling organization in that zone will win the Chicago trips.

Automotive Oddities—By Pete Keenan

Write us if you
know an Oddity



THIS OIL TANKER CAUGHT FIRE AT SEA AND BURNED FOR 3 DAYS MOST OF THE BOAT WAS BURNED TO A CINDER. YET NOT ONE DROP OF ITS CARGO 1,500,000 GALLONS OF GASOLINE WAS LOST
Aug 1929.

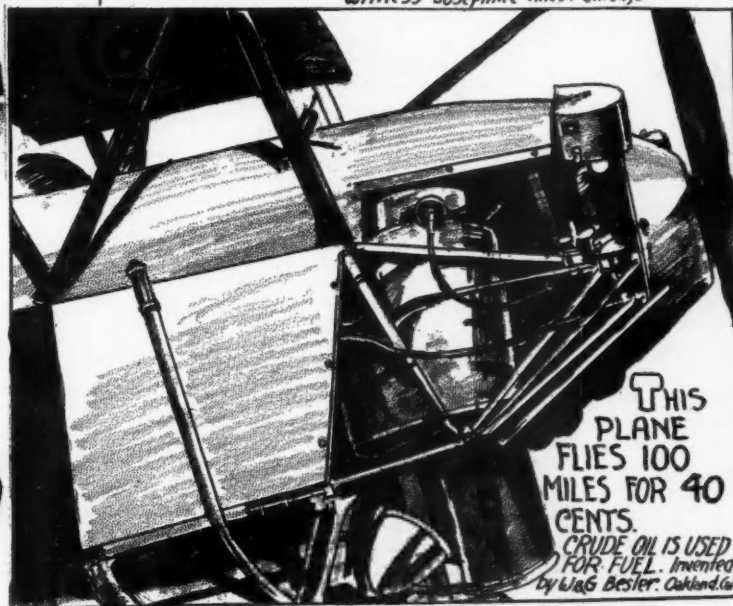


BECAUSE SHE CANNOT CRY AFTER BEING HIT BY AN AUTO MARION O'CONNEL GOT \$5,000 DAMAGES

A \$40.00 DIAMOND PUNCTURED R.M SMITHS TIRE (HOW'S THAT FOR LUCK)



ON THE 3rd DAY OF THE 3rd MONTH 1933 C.A. BLOOM LOOKED AT HIS SPEEDOMETER AND IT READ 33.333 THE TRIP MILEAGE READ 33.3
Witness Josephine Alles. Chicago



THIS PLANE FLIES 100 MILES FOR 40 CENTS.

CRUDE OIL IS USED FOR FUEL. Invented by W.G. Bestler. Oakland, Cal.

S-W Reveals New Sales and Production Plans

Has New Free-Wheeling Unit and Is Completing Development of Automatic Clutch

CHICAGO — A practical reorganization of production and sales designed to decrease expense and to build up wider and more intensive distribution is announced by C. B. Smith, president of the Stewart-Warner Corp., following the appointments revealed in last week's *Automotive Industries* of J. E. Otis, Jr., as general manager, and Frank A. Hiter as general sales manager.

Mr. Smith also announces the closing of a contract for a new type of free-wheeling unit and that the corporation is completing development work on an automatic clutch.

Combinations of lines and plant facilities are expected to bring great economies both in production and sales. One of the amalgamations already completed is the combination of the Alemite plant with the Stewart-Warner factory. This merger was made possible by the recent acquisition of additional factory space by purchase at a nominal figure from the American Bridge Co. of a large property located just south of the Stewart-Warner plant. The corporation's field distributing organization also has been completely reorganized.

Sales of the corporation and its subsidiaries have increased substantially in the last 30 days necessitating a 70 per cent increase in employment.

10 to 30 M.P.H. In 6.2 Seconds

The Essex Terraplane Eight produced the best acceleration figures yet recorded by *The Autocar* (British) in the tests it has conducted over a period of years on a wide variety of cars. The Terraplane tests showed acceleration from 10 to 30 m.p.h. in 6.2 sec. in high gear, 4 sec. in second and 3.2 sec. in low. The respective overall gear ratios were 4.11, 6.6 and 9.9. A top speed of 82.57 m.p.h. was attained.

The car tested was a four-door sedan, the engine piston displacement being 245 cu. in. Tires were 16 x 6.00 in.

Roller Bearing Standard Proposed for Approval

WASHINGTON, D. C.—A revised draft of Simplified Practice Recommendation R67 covering tapered roller bearings, which was prepared by the standing committee of the industry, has been mailed to all interests by the division of simplified practice of the Bureau of Standards.

In addition to bringing the simplified

practice recommendation into accord with the Society of Automotive Engineers' revised standard for tapered roller bearings, the proposed revision covers sizes up to 12-inch bore together with certain steep angle bearings for naval and general use.

Olsen at Chicago

PHILADELPHIA, PA.—An exhibit of testing machines will be made at the Century of Progress in Chicago by the Tinius Olsen Testing Machine Co. of this city. The exhibit will include universal testing machines of 60,000 and 2000 lb. capacity, hardness testing equipment, a ductility testing machine, one of the latest types of Olsen Lundgren dynamic balancing machines and various types of strain gages, extensometers, and instruments, together with proving rings.

William L. Locke

DETROIT—William L. Locke, 86 years old, died May 6 after a brief illness. Mr. Locke, after many years in the Michigan lumbering industry, became an officer of a carriage manufacturing company, which later began the manufacture of electric automobiles and afterward became the Murray Body Corp. He retired in 1925.

CALENDAR OF COMING EVENTS

SHOWS

National Metal Exposition, Detroit Oct. 2-6
Motor & Equipment Manufacturers Assoc., Chicago Oct. 23-28
Natl. Standard Parts Assoc., Chicago Oct. 30-Nov. 3
New York Automobile Show, Jan. 6, 1934

CONVENTIONS

National Association of Cost Accountants Convention, Waldorf-Astoria Hotel, New York June 12-15
National Industrial Advertisers Assoc., Chicago June 26-28
National Metal Congress, Detroit Oct. 2-6

MEETINGS

Natl. Automobile Chamber of Commerce, Annual, New York City, June 8
Natl. Retail Hardware Assoc., Indianapolis June 12-16
A.S.M.E. Natl. Aeronautic Meeting, Chicago June 26-27
American Society for Testing Materials, Chicago June 26-30
Automotive Engine Rebuilders Assoc., Annual, Chicago July 10-14
International Automotive Engineering Congress of the S.A.E., Chicago Aug. 28-Sept. 4
American Chemical Society, Chicago Sept. 11-15
American Transit Assoc., Chicago Sept. 18-20
Natl. Safety Council, Chicago Oct. 2-6
National Metal Congress, Detroit, Oct. 2-6
American Petroleum Institute, Annual, Chicago Oct. 24-26

RACES

Indianapolis Race May 30

Motor Transport Asks Only for a Fair Field

Uniform Weight and Length Rules in Public Interest, Swayne Tells Economic Club

NEW YORK—National transportation policies from the standpoint of the highway user were discussed by Alfred H. Swayne, vice-president of the General Motors Corp., before a recent meeting of the Economic Club. With new practices of commerce and distribution growing up on all sides as new facilities for movement are provided, Mr. Swayne emphasized that "All that any special interest in this situation can hope for is a fair field with no favorites. That is all that highway transport has asked for. All that it desires. Given that, it will work out its destiny in cooperation with the public who constitute its customers and who, after all, must prevail in the long run."

In connection with railroads, Mr. Swayne said: "Since the railroad was the sole major element in land transportation, a physical rail development was compelled which went far beyond what would have been necessary had the motor and rail come hand in hand. This being the case, one of the major necessities of the moment is a thorough-going reorganization of our railroad systems, which will include scrapping of unprofitable and unnecessary railroad mileage, a revamping of a costly and widespread terminal practice, and a far more general application of the truck and bus in those short-distance, individual, less-than-carload, off-track movements for which they are so admirably adapted."

Commenting on the fact that the Joint Committee did not reach agreement on the question of maximum weight and length, Mr. Swayne said that the railroads wanted to leave these matters to the individual states. "Such a view is shortsighted in my judgment, not solely from the point of the highway user, but from that of the railroad as well, because the railroad of the future will be a transportation agency. Whatever unwise restrictions, limitations or other added costs, then, are placed upon the motor vehicle today must eventually be shared by other carriers as their field of service grows. Obviously....once highway users have paid for their share of road costs and have agreed to travel with due regard for the rights of others, no further impositions are allowable in the public interest. Reciprocity which takes into account fair distribution of costs becomes a matter of course."

Morse Chain Annual Report

CHICAGO—Morse Chain Co., controlled by Borg-Warner Corp., reports net loss after charges for 1932 of \$430,626.